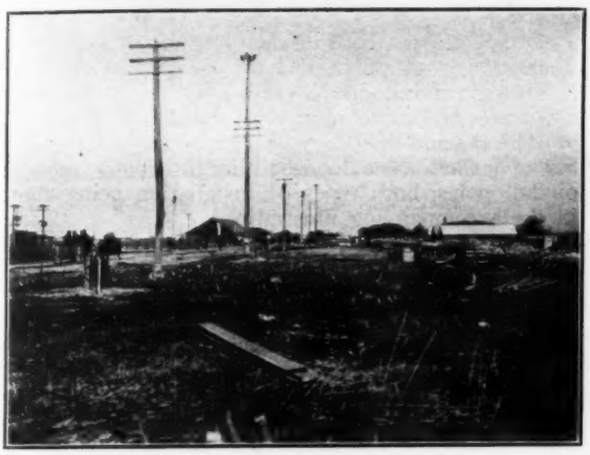
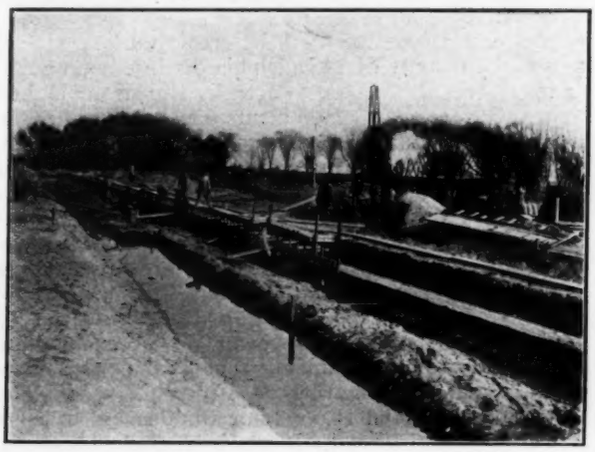
Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

Vol. 72—No. 7. CHICAGO, SATURDAY, FEBRUARY 16, 1918. Page 267.



Pole Line Serving Hog Island, Showing Flood-Lighting Projectors on High Poles.



Laying Electrical Conduits for Underground Service on Hog Island.

Philadelphia Electric Company's Government Work

War Plants on Delaware River Use 100,000 Kilowatts—Hog Island Shipyard to Use 35,000 Kilowatts—Details of Work

By HENRY W. YOUNG

WHAT we are doing over here is going to help a lot over there." This is the thought expressed in a widely circulated poster. The Philadelphia Electric Company is certainly living up to the idea. Because of its location, this central station is permitted to aid in government work to a larger extent, probably, than any other in the country. A glance at the topographical map will show why.

Electric energy from the lines of the Philadelphia Electric Company is supplied to the extent of 100,000 kilowatts, devoted to war purposes. All the great shipbuilding yards of the Philadelphia district, on the Delaware River, with the exception of the New York Shipbuilding Company, are receiving their supply from this source. In addition there are the monster plants of the American Locomotive Works, the Remington Arms Company and the Eddystone Munitions Company.

C. J. Russell, sales manager of the company, explained to the writer on January 26 that in the two previous weeks 15,000 kilowatts demand had been contracted for. To meet such sudden and great demands for service would be a tax on the resourcefulness of any central-station company, even that of the third city of the nation. But the only way to do a thing is to go ahead and do it, and the Philadelphia company simply goes along and tackles everything in sight.

Hog Island and Its Problems.

As an example of big things coming fast, take the shipbuilding plant at Hog Island. A few words aside from electrical features will be necessary for the reader to grasp the true significance and the vastness of this undertaking.

This plant is one of those at which will be assembled the steel fabricated ships contracted for by the Emergency Fleet Corporation. It is also the largest one, for 15 per cent of the total tonnage will be erected here in the next 18 months. Stated in another way, the next year and a half will see 120 steel ships turned out of this yard—50 of 7500 tons dead weight each, 400 feet long, and 70 of 8000 tons dead weight, 450 feet long. These are to be finished within 22 months from last September, when the contract was signed, or by July, 1919.

About three months ago Hog Island was a sand and mud flat, more than two miles long and one mile wide, oval in form and containing about 900 acres.

Then the American International Shipbuilding Cor-

poration, which is a subsidiary of the American International Corporation, took hold as agents for the Emergency Fleet Corporation, to build the shipyard.

Plank and macadam roadways had to be built first. Then came the shops, administration buildings and other similar structures, covering 20 acres. Seventy-five miles of railroad was built, upon which are to be operated 25 locomotives, 500 freight cars and 50 passenger coaches.

The water supply for this project is equivalent to that required by a city the size of Minneapolis. The sewerage system would take care of a city of 60,000 inhabitants.

At least 30,000 men will be employed. A careful canvass of the city of Philadelphia disclosed accommodations for only 15,000. Barracks similar to United States Government cantonments have been built on Hog Island to take care of 3000 to 5000 single men. Other plans are now in progress for the erection of 3500 to 4000 houses on land near the Island.

When a thing of this sort springs up in 90 days it is not to be wondered at that the Philadelphia Electric Company officials and employees are kept "on the jump." At Hog Island, alone, there will be some 600 motors required, representing a connected load of approximately 28,000 horsepower. That is the shipbuilding company's estimate. The Philadelphia company is, however, figuring on 30,000 to 35,000 kilowatts connected and 15,000 kilowatts demand to cover power and lighting load. It may be remarked also that these are 24-hour installations for the most part.

In a shipbuilding plant of this type, for the erection of fabricated ships, much of the power is used on cranes, hoists and other material-handling equipment. Over 50 per cent of the motor load will, however, be for air-compressor service. Fifteen thousand cubic feet of free air will have to be compressed every minute. This will be the largest compressed air plant in the world with one exception—the Rand Mines in South Africa.

Current for Hog Island will be furnished at 66,000 volts, three phase, tapped off from the line between the Chester Station and the main generating station in Philadelphia. The high-tension lines will be carried on steel towers as shown in one of the accompanying illustrations.

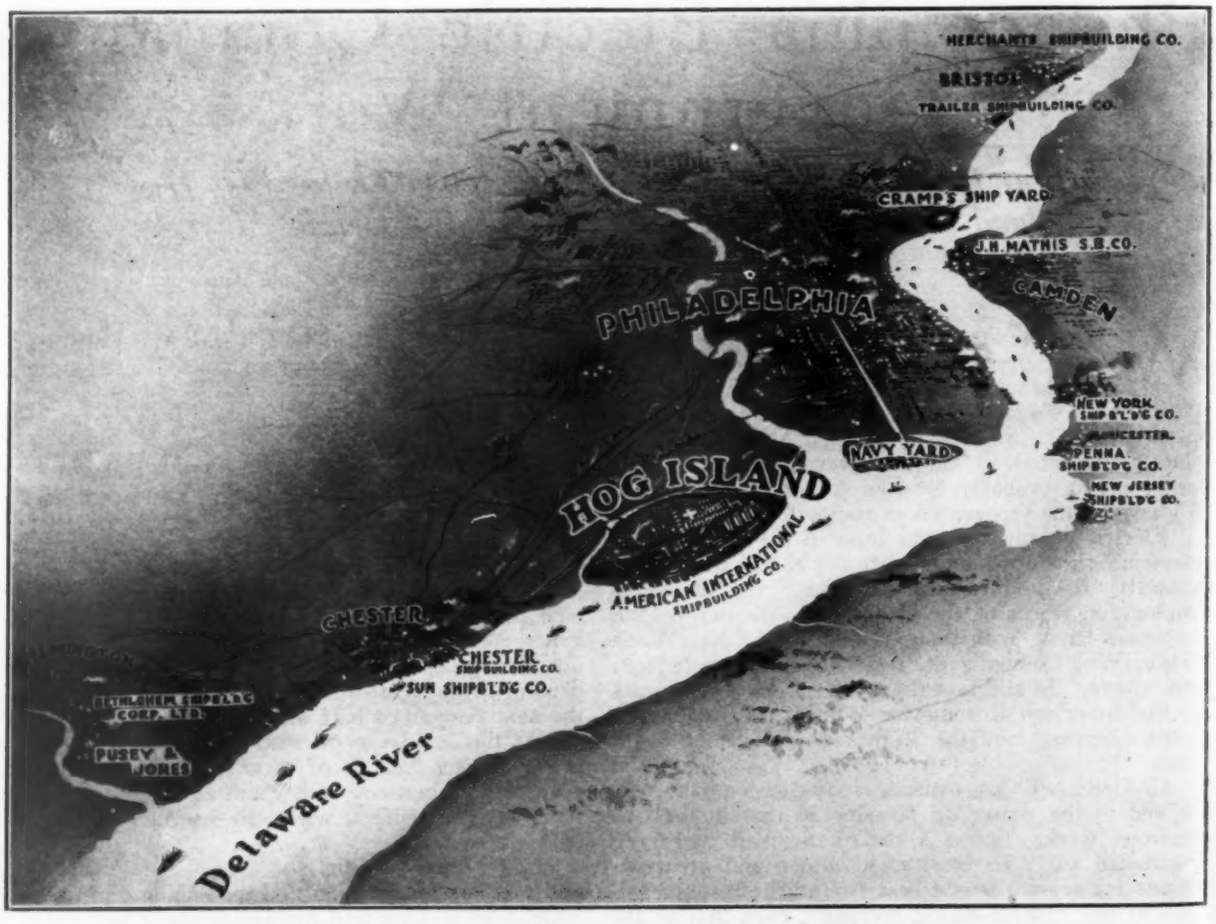
Much of the distribution system will be through underground conduit. One of the views shows the laying of conduit on November 17, 1917, the sewer and water trench being in the foreground.

The outside lighting will be arcs and a large number of incandescent flood-lighting projectors, mounted on tall poles, both types of installation being shown in the accompanying illustrations.

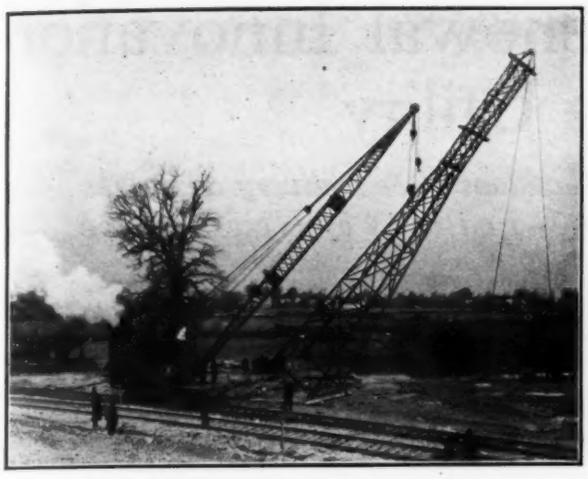
One of these iliustrations shows also a substation in course of erection.

Current is furnished to the shipbuilding company on the basis of the Philadelphia Company's rate "E" high load-factor power service. That is, alternating current untransformed and guaranteeing to the company a minimum use of the demand 6120 hours per annum, equivalent to 20 hours a day, 306 days annually. There are also included a "standby charge" and "prompt payment discount."

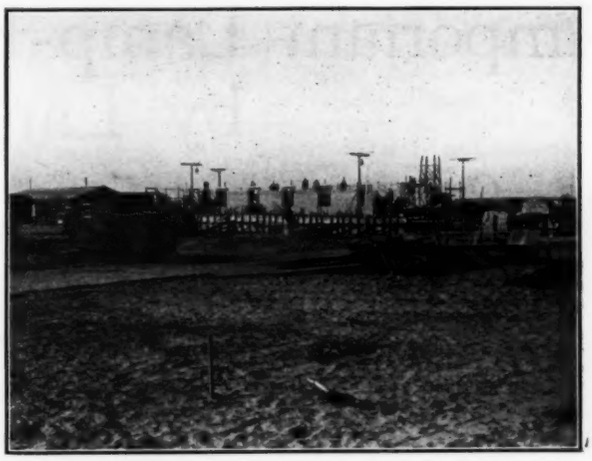
At the time of this writing the views of Hog Island show scenes of mighty activity and seeming



Topographical Map of Delaware River Showing Shipyards Using Philadelphia Electric Service.



Erecting Steel Tower on Hog Island.



Construction of Substation at Hog Island.
Arc Lamps and Projectors Provided for Night Work.

confusion. The scene is changing daily, however, and almost by the time this has been printed and in the hands of the readers of the ELECTRICAL REVIEW, will have changed into one showing a vast and orderly plant, the output of which is to answer the cry of "Ships, ships and more ships."

ELECTRICALLY EQUIPPED OIL REFINERY AT EAST CHICAGO READY TO OPERATE.

Sinclair Company Is Erecting Steam-Electric Power House—Plans Using Exhaust from Steam Turbines.

The Sinclair Oil & Refining Company, which has completed a 500-mile pipe line from Cushing, Okla., by way of Kansas City, Mo., to East Chicago, Ind., has the initial units of its oil refinery at the latter place ready to begin operations in February. The plant is starting with 40 main batteries of crude oil stills, of the capacity of 10,000 barrels per day.

All the machinery, comprising pumps, elevators, air compressors, stokers and coal-handling devices, is equipped for electric drive, for which about 150 motors of a combined capacity of 2400 horsepower are required. The company, for a number of months, has had under construction a power plant for producing the electric energy required, as well as to furnish exhaust steam used in the oil-refining processes. This power house is expected to be ready for service by July 1. In the meantime, electric power for present uses is being supplied by the Northern Indiana Gas & Electric Company.

Although the Sinclair company has abundant supplies of oil, it has been decided to be more advisable to use coal as fuel in its generating station. The power-house equipment comprises 12 boilers of a combined rated capacity of 7500 horsepower, which are being equipped with mechanical stokers and turbo-centrifugal feed-water pumps; there are also being installed two turbogenerators, each of 1500 kilowatts capacity. The turbines are of the high-pressure type, whose exhaust steam will be utilized at the stills as a requirement of the refining process. Electric power will be distributed to the various division transformers at 2300 volts, where it will be stepped down to 440 volts for motor drive.

The greater use of motors is for operating centrifugal and rotary pumps in handling crude oil and oil products. In most cases synchronous motors are employed for both types of pumps, being direct-connected. Most pumps are of about 500 gallons capacity per minute and operate against an average head of about 40 feet. Three air compressors, each driven by a 60-horsepower motor, supply air for tank agitating of liquids, and for air hammers and machine tools. A large-capacity fire pump, to which a motor is connected, starts automatically when any hydrant is opened.

Series yard lights are used for illuminating the premises, these being supplemented by flood lights. By reason of the explosive character of the material handled at the plant, and because the atmosphere is to some extent permeated with gasoline fumes, all wires are carried in air-tight steel conduits, which are tested for leaks with ether at the time of installation. For the same reason, all lamps are placed in vaporproof receptacles; and all motor control switches are of the oil-submerged type, and furnished with overload relays to obviate the necessity of having fuses which might be removed while current was on, causing an arc. Even the light switches are vaporproof, with fuses so arranged that they cannot be removed while the circuit is closed. The conduits are set up with linseed oil and plaster of paris: the extension cords are armored and furnished with vaporproof lamp receptacles.

The coal-handling facilities at the power house are of the most modern kind. The coal is dumped from cars into track pits, which are lined with reinforced concrete. It is carried by feeder conveyors to the base of a bucket elevator by which it is raised and discharged upon a distributing conveyor in the top part of the building. The conveyor discharges into concrete bunkers which are suspended above the aisle between boilers. The bunkers, which have a capacity of 1300 tons, are suspended from the steel beams of the main building structure. The coarse coal is crushed to the required size at a central crushing and screening plant. Part of the crushed coal is taken to the power house and another part is conveyed to the stokers under the refining stills, of which there are now 40 in operation.

New Officers of Electrical Section, Western Society of Engineers.—The Electrical Section of the Western Society of Engineers has chosen as its officers for 1918 the following named gentlemen, all of Chicago: Chairman, E. N. Lake; vice-chairman, J. C. Cravath; members of executive committee, C. H. Norwood and Ernest Lunn.

Important Lamp-Renewal Innovation by Large Utility

Commonwealth Edison Company Abandons Free Delivery of Lamps on Renewal as Economical Measure—Features of New Service

HIGH cost of materials, increased wages and labor shortages, the general higher expense of doing business have combined to necessitate a general retrenchment in the way of reducing operating expenses. In the case of the public utilities many and varied have been the policies evolved to cope with soaring fuel costs, reduced revenue due to curtailed production and increased operating expenses generally.

Increased rates have been an outstanding feature during the last year, occasioned largely by the increase of coal. Fuel is not the only item in operating expenses, however, for overhead charges and labor are large items, of greater importance even than fuel with the smaller consumer, and the residential customers in particular. Service as well as energy is costing more than it cost a year ago. There has been a nation-wide appeal to practice economy, to follow the creed of thrift by eliminating the luxuries and adhering only to the necessities, as essential measures for winning the war.

The service and the energy charge have long been recognized as being both necessary in paying for central-station service. Energy is necessary, as such, in all walks of life. Service, as such is, however, perhaps a luxury, and may be considered as such during war time.

In the matter of choosing between increasing rates or eliminating some of the luxuries of "service," the choice should lie invariably with the latter, because energy cannot be dispensed with, whereas service in the sense understood here can to very large degree. Upon this understanding the recent policy adopted by the Commonwealth Edison Company regarding lamp renewals is of particular interest. The policy aims to conserve labor by using it to best advantage where it is most needed, saving fuel, reducing an item of expense that may rightly come under the title of luxury, and thus reduce expenses generally.

In the past the Commonwealth Edison Company has delivered free new lamps in exchange for old, charging nothing for the delivery, and charging only for renewed lamps below 50 watts, as shown in the accompanying table:

Lamp Sizes.	Price.
All sizes 50 watts and above free	...
40 watts	10c
25 watts	12c
15 watts	18c
10 watts	20c

In the past requests in person or by telephone have been answered with the lamps within 24 hours or so. For this purpose the company maintained 17 electric delivery wagons and their drivers and the labor required to maintain them and energy to charge them. The mileage covered by the electric trucks used to average 35 miles per diem, with an average exchange of 7 to 8 lamps per call. Each driver would make some 70 calls per day, equivalent to two calls per mile. On the basis of customers per mile, or ampere-hours per lamp exchanged, it may be seen that such service imposes a hardship on the utility, and moreover, might be considered in the light of a luxury to the person served during war times.

Renewal Stations Established.

In the matter of retrenchment those things not absolutely necessary should obviously be abandoned first, for the common good. Free lamp renewal deliveries was considered by the Commonwealth Edison Company to be one of these. The company has therefore ceased delivering free lamps, new or in exchange, since February 1. Instead, lamp-renewal stations have been opened in various parts of the city, where old lamps may be exchanged for new. Lamp deliveries have not been discontinued entirely, however. Those that prefer to have their lamps delivered may have them by paying a nominal charge of 35 cents per call, which is the same charge as made for calls for troublemen and for the repair of devices. The charge is made merely to cover the expense of the trip, and thus where a call is made for a repair or troubleman and a request is made at the same time for lamps, if both are obtained by one call, only one charge of 35 cents is made.

Some 24 lamp-renewal stations have so far been opened. Some of these stations are buildings that belong to the company and have already been long used as lamp-renewal stations, for service applications and the payment of light and power bills. Where company stores were lacking, drug and hardware stores have been employed. In one case where no suitable store was available, a store has been rented for the special purpose of exchanging lamps.

The number of lamps exchanged at the individual stores varies considerably both as regards number daily, number per customer, and as to size. For example, in the residential districts the smaller lamps are in the majority, and the individual exchange small. In the downtown district the units are larger and also the number exchanged at one time, as here the buildings, stores and offices have to be supplied. Again in the industrial and commercial districts, the small sign

To Our Customers:

We wish to direct your attention to the convenience of exchanging your burned out incandescent lamps bearing our etching for new ones at our various renewal stations. There you may see samples of all available types and have the advantage of a complete stock in charge of a fully informed attendant who will gladly assist you in choosing the kinds best adapted to your particular needs.

For some time we have maintained stations at twelve of the locations listed on the reverse of this sheet. These have been so successful that we are now establishing others at twelve additional points as indicated, which will be open on or before February 1, 1918. One or more of these will be found conveniently located with relation to your home or business, and at the most, a short car ride will give you immediate service. (*See list of Service Stations on reverse side.*)

In special cases where you are unable to go to the station, we will deliver the lamps to your home, store or office at our regular service charge of 35 cents per call. To secure this latter accommodation, it is only necessary to phone us at Randolph 1280, giving your requirements to our Service Bureau operator.

January 15, 1918. COMMONWEALTH EDISON COMPANY.

Notice Sent to Customers Advising of Change in Renewal Policy.

lamps and the large store and window-lighting units are the predominating classes.

Only Two Delivery Wagons Retained.

Two electric delivery trucks are at present retained for the renewal service. These trucks deliver the supply of lamps to the various stores or stations and take up the exchanged and discarded lamps. Lamps are delivered in cartons from the warehouse, after inspection. At the stations they are sorted out and placed into distinguishing cartons, which in turn are placed in bins or cupboards immediately behind the customers' counter. Directly below these shelves are the bins into which the worn-out lamps are placed. These bins have an individual capacity of 400 lamps or more. When convenient or necessary, these storage bins are emptied and the lamps placed back in the packing cartons, which hold about 300 apiece, and are collected by the delivery trucks on their weekly or bi-weekly visits.

Lamp-Renewal Records.

The records kept are the simplest. Lamps received from the warehouse are receipted by the man in charge of the renewal station. All lamps given in exchange are receipted by the customer making the exchange, as are also all lamps taken away by the drivers. In this way the situation is at once seen as to lamps on hand. Individual stock of each class of lamp, voltage size, shape, whether frosted, and so forth, is kept.

The number of lamps exchanged daily depends, of course, upon the locality in which the renewal station is situated, namely, the density and class of load, and also to a large extent upon the weather. The seasonal demand may also be expected to vary over a wide range, as good weather brings out many who stay in on a bad day.

Although the new policy of lamp renewals has been in vogue only slightly more than half a month, it has been found that the public are pleased with it, which is perhaps surprising, as the weather since its inauguration has been not of the best. In the past many customers took no advantage of the free delivery and thus the unit cost individually has been higher than it otherwise would have been. One result of the change of policy is that customers are better able to change a few lamps at one time instead of waiting for them to pile up before an exchange was worth while; the load-factor of the stations is higher, the distribution is more even, and thus delays and annoyances as where there is congestion are absent.

Saving Effected by New Policy.

It is too early at the present time to determine the actual saving in cost of lamp renewals, either for the lamps or the service. There is, of course, the saving due to eliminating 15 electric trucks and the labor attached, making them available for more important work elsewhere. Whatever the saving, it will be one due to curtailment of one item of central-station service that is, at best, a luxury that strictly plays no part in actual development of the community, hence that can be dispensed with, at best with only a little inconvenience of the minority.

Cincinnati Electrical Men Merge Organizations.—At a well attended meeting of Cincinnati electrical men held on the evening of January 15 at the Hotel Sinton, following an enjoyable dinner at the same place, the merger of the Cincinnati branch of the Jovian League and the Cincinnati Electrical Club was consummated, and the following officers for the joint organization elected: President, Frank D. Van Winkle; first vice-president, James A. Brett; second vice-president, O. B. Marsh; secretary and treasurer, Jos. C. Bowman; directors, W. W. Freeman, Walter A. Draper and W. J. Hanley. The merger was the result of work which has been going on for several months looking to that end, as members of both organizations realized that the duplication of effort and expense involved was useless. Committees were therefore appointed from the two bodies, which met and arranged plans for the consolidation, under which membership in the Cincinnati Jovian Electric Club, as the new organization is known, does not necessarily involve membership in the national Jovian organization as well. These plans were separately indorsed by the two clubs, and at the joint meeting of January 15 full ratification was had from the members. Speakers at the meeting, besides the officers, were Street Railway Director W. C. Culkins and Walter A. Draper, of the Cincinnati Traction Company.

Illinois Companies Petition Commission for Immediate Rate Increases.—The Illinois Public Utilities Commission is asked by a number of petitioning companies, who desire an increase in light, heat, power, gas or street car service to allow the increase immediately and permit the company to enjoy the privilege of higher rates during the weeks or months the investigation as to the equity of the case is carried on. The companies state that they can then make any adjustments necessary with their customers in the event that the ruling of the commission is unfavorable to the petitioners. The Southern Illinois Light & Power Company has applied to the Commission for permission to increase its lighting rates at Gillespie, Ill. The Consolidated Light & Power Company has petitioned the Commission to grant increased rates for lighting and power service in Galva and Kewanee.

Illinois Commission to Consider Uniform Account System.

The Illinois Public Utilities Commission has arranged a hearing upon the adoption of a tentative draft of a uniform system of accounts which is contemplated for the use of all electric utilities coming under its jurisdiction. The classification of accounts is made after a careful study of the classifications prescribed by the commissions of the various states as well as by the Interstate Commerce Commission. Consideration has also been given to the recommendations of the Committee of Uniform Classification of the Accounts of the National Electric Light Association which committee has, during the past few months, been engaged in a survey of accounting systems in use in various states.

Ottumwa Company's Station Capacity Increased.—A new 1250-kilowatt turbine of the Ottumwa Railway & Light Company, Ottumwa, Iowa, has been completed and placed in operation. Included with this improvement is a new intake from the river, settling tanks, condensing equipment, boiler feed pumps, water softener and service pumps. The enlargement of the Company's station capacity was necessary to supply energy for the increasing business of the Company, including the community of Fairfield (transmission line recently completed) and for other communities in that vicinity.

Enlisting Women in Electrical Work

An Account of What British Women Are Doing in Electrical Factories and Central-Station Plants

By ALBERT H. BRIDGE

The accompanying photographs were authorized for publication in the ELECTRICAL REVIEW *by the Ministry of Munitions, Labor Supply Department, London, Eng.*

THE manufacture of munitions of war has called hundreds of thousands of women to the engineering factories of England. Of particular interest are their activities in many kinds of electrical manufacturing work. In dealing with the subject some time ago we presented information respecting the operations in which they were engaged in connection with the production, in pre-war times, of electric lamps and small electrical accessories and in armature winding and other like service. The aptitude and deftness shown by women in such branches of normal industrial life were qualities which essentially fitted them for a great extension of such activities in the emergency of war when they were called upon to take the place of men needed for the fighting forces. Large numbers of them are today engaged upon electrical work of most varied classes that probably never would have fallen to them in the ordinary course of industry. The probability is that they will in many cases desire to continue the same class of work for years to come under the improved conditions which welfare work has brought into many an English factory during the war.

At the time of writing there is a louder call than ever in England for women to enlist for handicraft of the kind, for the "combing-out" of physically fit young men left in the works makes it imperative that women shall leave concerns of less urgent importance and take their places at the bench for the duration of the war.

EDUCATIONAL CAMPAIGN NECESSARY.

The British Ministry of Munitions through its Labor Supply Department has been doing excellent service in the above matter for some time past, engendering a receptive state of mind on the part of manufacturers who were previously disinclined to employ female labor, and educating the workers as to the needs and the possibilities. By means of a well organized series of instructive exhibitions in London, Bristol, Sheffield and other centers, it has demonstrated how numerous are the operations being performed and how varied are the types of product turned out by female labor. The two-fold purpose of educating the public, and so securing accessions to the ranks of the workers, and of stimulating manufacturers has been well served. By means of a large and unique array of photographs and by a collection of samples of actual work, convincing evidence has been produced of some of the technical things that a

Women Winding Armature Coils.

Women Operating Notching Press.

woman can do amid healthy surroundings after only a comparatively short period of training. Aircraft and tank engines, stationary engines and turbines, tool-room work, optical apparatus and surgical and

Women Assembling Small Motors.

chemical glassware, are among the departments of war work covered in these exhibits.

The examples of work in the collection include spark-plug parts, complete magnetos, lampholders, armature parts, lighting switchboards for mechanical transport work and scientific instruments, upon which women have done the drilling or milling, winding, engraving, assembling, etc.

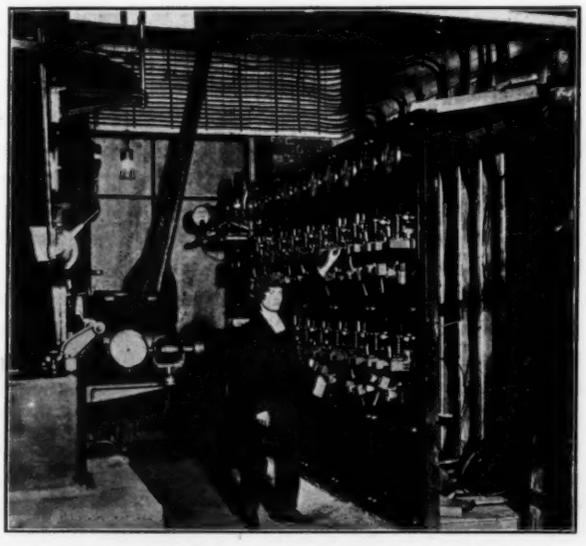
The photographs displayed are eloquent concerning wider and larger operations. They include women engaged in various activities in connection with shipbuilding, marine engineering, tool-room and precision work, small-arms work, manufacturing parts for internal-combustion engines, and general engineering. I observed photographs of women engaged on wiring and rolling mills, operating all kinds of lathes and similar machinery, building small commutators, operating presses for armature work, assembling ironclad switchgear, erecting switchboards, driving 40-ton cranes, in charge of motors on industrial installations, driving electric trucks, electrically welding, electric contact mines, operating a 500-kilowatt switchboard, attending a 300-kilowatt direct-coupled engine set, and in charge of a 1000-horsepower steam engine.

By the courtesy of the Ministry Labour Supply Department the ELECTRICAL REVIEW is enabled to show a selection of these photographs, depicting women engaged in some of the purely electrical departments of munition manufacturing, such as commutator and collector assembling, armature-coil winding, motor assembling, and attending a 500-kilowatt switchboard. These are typical examples of the part that British women are already playing, and according to present indications are destined to perform more extensively in coming months, in furnishing some of the essential manufactures of an engineering war.

PLANS FOR SEATTLE'S PROPOSED HYDRO-ELECTRIC PLANT.

Revised Specifications Approved by Board of Public Works—Bids to Be Opened at Once.

Revised specifications for Seattle's proposed hydroelectric power plant, to be supplementary to existing hydroelectric and steam-electric plants, have been examined and approved by the Board of Public Works. Sites for water power and generating units, in various places on Federal forest reserves, have been examined and their advantages analyzed. Contractors, who are to submit bids to be opened March 1, are to make up their proposals applicable to one or more of the sites which have been considered, and the city undertakes to acquire the necessary rights for any site specified under the accepted bid. The proposed work involves the construction of concrete dams, pipe lines, forebay, penstocks and power house; and the installation of water turbines, generators, switchboards, transformers and all accessory equipment. The specifications require two alternating-current, three-phase, 60-cycle, 6600-volt, 9500-kilowatt generators, of revolving-field type, so designed that they may be operated in parallel; also, exciter units of a potential of 250 volts, together with a motor-operated rheostat for each generator. They also require two direct-current, 250-kilowatt generators to supply current for excitation. The latter two generators are to be direct-connected to, and driven by, smaller water wheels. The installation is to include two duplicate interpole generators to supply current for switch control, emergency lamp circuits and crane; one of these generators is to be direct-connected to a 220-volt, 2-phase, 150-horsepower induction motor, the other generator to be connected to a similar motor and to a 150-horsepower water wheel; the generator,



Women in Charge of a 500-Kilowatt Switchboard.

motor and water wheel to be on a common shaft and mounted upon a common bedplate.

There are to be ten transformers, arranged in three banks of three transformers each, with one additional. The specifications cover in detail all phases of the required plant equipment, as well as complete data on the proposed transmission lines from the plant to the city of Seattle.

Editorial Comment

Free Lamp Delivery a Luxury

FOR a long time wages have been going up, materials have cost more, fuel has increased in price in some instances as much as 100 per cent. Practically every item in public utility operating expense has increased and just as surely has almost every factor connected with gross revenue decreased. Loads have been curtailed by reduced store-window lighting, by lightless nights, fuelless days, loads that have in the past gone largely toward paying for the overhead charges. While revenue has gone down, the cost of doing business has gone up, until many are the companies that have had to raise, or ask permission of the utility commissions to be allowed to raise, their rates. Of course, the smaller companies have been the first to feel the pinch of dwindling revenue and cost that have become heavier and heavier. Perhaps, naturally, they have been the first, therefore, to raise the cost of their product.

If public utilities are to maintain their strong position, so vitally important to the community they serve, there must be a certain margin between revenue and expenses that will assure ability to obtain capital, keep existing plant in efficient working condition, and take care of normal growth. At this time it is a choice between raising rates or reducing operating expenses. The smaller companies have perhaps little choice; the larger ones may curtail their expenses here and there and thus possibly tide over these uncertain and difficult times. But if operating expenses are to be cut they must be cut where they will interfere least with the present and future value of the utility and their ability to serve the public. It is not a matter of whether retrenchment is necessary, but where it is possible. Some companies have increased their rates; others have ceased renewing lamps free of charge.

Retrenchment has come everywhere, in every walk of life, in keeping with the nation-wide movement toward general economy and thrift. Sound and wise, thoughtful and judicious retrenchment means eliminating those things not absolutely necessary first—the luxuries, the extravagances, the thing one can do without—leaving those things upon which our economic existence is founded until as a last resort. Elsewhere will be found described the manner in which one large utility has eliminated one of its luxuries of service without effecting one whit the community as a whole nor working any hardship upon the individual. Instead of delivering lamp renewals free, delivery will be charged for. There is no doubt about the desirability of free lamp renewals as regards proper lighting and healthy growth. There is no denying the wisdom of the central station controlling the lamp situation in its own territory if low lighting costs, correct utilization of electric service are to obtain. Both these are intimately and vitally related to the growth of effective and efficient illumination and minimum cost. To give free lamp renewals is costly, and some companies have already abandoned the practice. Maintaining free lamp renewals but cessation of free delivery continues the encouragement of proper lighting, while the cost of encouraging it is somewhat curtailed. Lamp renewal stations are scattered throughout the territory served, from which those desiring can renew their lamps with little trouble, but at saving to the utility.

The slogan of the department store, "Pay cash and carry," has only been extended to the utility, for the common good.

Placing the Electric Where it Belongs

IF EVER the electric vehicle, whether for industrial or commercial purposes, were needed it is needed now. If ever conditions were favorable for the utilization of the electric truck and tractor upon a large scale, the opportunity is today.

Numerous movements are afoot to reduce the cost of freight handling and extend the usefulness of terminals by speeding up the movement of freight. Large trucking schemes are in course of development that aim to cut delivery costs and reduce car shortages. For this service the electric truck offers many advantages. With the advent of women into fields of endeavor once thought belonging only to man's domain, the electric truck and tractor for road and factory assume an added importance as an extremely useful factor in the conservation of man-power. With road construction and maintenance largely curtailed because of labor shortages and inability to move road materials, the electric with its smoother operation and lower wear and tear on the roads makes it the champion of good-roads movement. For ease of running and control, for simplicity of maintenance, for conserving fuel, gasoline and rubber, the electric is unsurpassed.

The advantages, and also the limitations, of the electric vehicle for the road, for the factory and for the mine, are known by its makers and the utilities generally. But the possible ultimate user does not know fully nor appreciate but slightly the possibilities of the electric for many purposes. And until they do the electric pleasure vehicle, the truck and tractor cannot be expected to replace the gasoline vehicle in the many instances where it ought, for low running and maintenance costs, simplicity and efficiency of performance and long life.

The present situation, as regards economics, transportation, cost of fuel, and scarcity and cost of labor are more favorable to the electric vehicle than ever

before. Now is the time for every one concerned with its development to co-operate and work together to place the electric vehicle where it rightly belongs and where it should be today, performing a national service.

The Coal Clause in Rate Increases

MANY things have happened since 1892 when Dr. Hopkinson in his paper on "Rates" before the Junior Engineering Society of London advocated that electrical rates should be composed of two parts, one for energy consumed and the other a fixed charge for service. Rates and rating has progressed to a science and has assumed complications and refinements as to off-peak service, load-factor, wattless components, and so forth, that were never dreamed of in those days. However, the refinements of today are only modifications and extensions of the fundamentals of rates as expounded by Hopkinson, Wright and Doherty, for practically all rates today include at least two and often more parts concerned with energy consumed, service and demand.

One of the outstanding features of the recent increase of utility rates has been the inclusion of the so-called coal clause. The reason is not far to seek, namely, because coal is one if not the chief item of operating expense for coal-burning plants. Coal has gone up from 75 to more than 100 per cent in cost in many cases. With a two or three-part rate the cost of coal has an important influence in the part of the rate based upon cost of energy. It seems, *a priori*, therefore, judicial and equitable to include in the energy charge a coal clause covering the increase in fuel cost.

The inclusion of this clause should not fall to all customers alike, nor proportionally, however. With customers purchasing bulk energy, untransformed, the cost of coal is often more than 50 per cent and not often less than 30 per cent of total operating expense while the remaining expense due to investment in generating and transmitting equipment and clerical labor are the chief remaining items. On the other hand, for the small residential customer the investment in substations, distributing transformers and lines, attendance to substations and lines and clerical work is high and the load period during which energy is consumed is short. With this class of customer the cost of coal is a small item, in some instances in the neighborhood of 5 per cent of total operating cost, the large item being investment, maintenance and labor.

In viewing the list of utilities that have increased their rates it will be noticed that the inclusion of the so-called coal clause has been mostly made to effect the large power users as distinct from the small users, the latter of whom are usually in the majority. As a customer using the more energy requires the consumption of the more coal, and as the cost of this coal is the big item in cost of this energy, inserting a coal clause for the larger consumers is fair to both utility and customer. In this connection it is rather interesting to remark that the small customer could not obtain either service or energy at the rates existent today were it not for the large consumer.

It should be remembered, in adopting the coal clause, that coal is not the only item of expense that has increased. Material costs have soared, wages have gone up, and the expense rightly chargeable to labor has been further increased in that the use of less skilled workmen has wasted materials and apparatus. The cost of capital has also increased, whereas its purchasing power has decreased, a decrease further produced where boilers are concerned since the availability of only inferior and dirty coal has reduced capacity. The coal clause is scientifically sound—so far as it goes. But it does not go far, although it is convenient, is fairly easily applied and permits of change with changing coal prices.

In the main, it is the smaller companies that have sought rate increases. And it is the smaller companies that usually find it more difficult to obtain highly efficient combustion of coal. It should be obvious therefore that each and every one is vitally concerned in hastening the day of efficient generation of electrical energy in bulk in the super-station with all the economies known at the present stage of the art.

The Need for Statistics

ONE of the very important questions with which the new association of electrical contractors and dealers will have to contend is that of compiling reliable statistics on the industry in which they are engaged. Although electrical contractors have been organized for many years, there has never been an effort made to collect data on general conditions, perhaps because of the great amount of work involved, and nowhere are there any reliable statistics on electrical retailing.

The first requisite is for an authentic list of the companies and individuals engaged in electrical contracting and retailing. If the Association is to wield the influence in the electrical industry that is expected of it, there must be reliable figures to substantiate its claims for recognition. An association representing 15,000 contractors and dealers will receive entirely different treatment at the hands of manufacturers, jobbers and central stations than an association representing 35,000 or 50,000; and who can now definitely state which figure is nearer actual facts.

This is but one instance of the need for statistics. What is the total purchasing power of contractors and dealers? What is the purchasing power subdivided as to commodities? What is the total payroll of contractors and dealers? What is the number of concerns not exclusively electrical handling electrical supplies? How many already-built houses are wired annually—and how many new houses?

These and many more questions must be answered and the Association of Electrical Contractors and Dealers can devote its energies to no better purpose than a compilation of such statistics.

Week's Events

Banquet of Lynn Section—Doherty on War Conditions—Referendum on Water Power—The Miami Conservation

ANNUAL BANQUET, LYNN SECTION, A. I. E. E.

Thomson Research Laboratory Dedicated—Addresses Made by E. W. Rice and Elihu Thomson.

Over 600 were seated at the seventh annual banquet of the Lynn Section, A. I. E. E., the occasion serving to dedicate the new Thomson Research Laboratory, now nearing completion.

Walter C. Fish, manager of the General Electric plant at West Lynn, was toastmaster and introduced as the first speaker, E. W. Rice, Jr., president of the American Institute of Electrical Engineers, who after a reference to the electrification of railroads as a most hopeful way of conserving fuel gave a thoughtful address on present conditions in relation to the great war. After referring to the progress made under the administration at Washington the speaker made an able plea for the enlistment of the best men in the land, irrespective of party, in the greatest work now before the country—the winning of the war.

Addresses were also made by Lieutenant Governor Calvin Coolidge, Walter H. Creamer, mayor of Lynn, and Captain F. P. Daw of the Second Canadian Artillery.

The concluding address was by Dr. Elihu Thomson of Swampscott, who spoke of the struggles of early days, and explained that a large section of the floor on which the banquet was held is to be devoted to a collection of historic models showing the development of the electrical business.

The new building is similar in dimensions to the fine administration building of the General Electric Company at its West Lynn works, to which it is joined. The new part has been designated as Building 68, and a large part of the second and fourth floors will be employed as a research laboratory.

DATA REQUIRED ON ENGINEERS IN GOVERNMENT SERVICE.

Engineering Council Asks Co-operation of All Engineers in Making Its Census Authentic.

The Engineering Council, through its American Engineering Service Committee, has during the past few months supplied to various Government departments and bureaus in response to their requests, several thousand names of engineers from which were to be selected to fill a great variety of positions in uniformed and civilian service for Army and Navy and other branches of the Government's activities in connection with the war, as well as for indirect service for manufacturers and contractors engaged upon Government war work.

To meet these demands the American Engineering Service Committee has assembled in its offices in the Engineering Societies Building, New York, extensive lists and much detailed information concerning engineers in all branches of the profession throughout the length and breadth of land. It will readily be appreciated that if these lists are to be maintained in the most useful condition to the Government and to Engineering Council, the committee should receive promptly information concerning each engineer who has gone into any kind of Government service, direct or indirect, so that a record may be made on his cards in the committee's office.

Engineers reading these lines, to whom this request applies, are urged to send at once their names, present addresses and occupations in the Government service, with brief statement as to whether or not they are available for other service, to American Engineering Service Committee, Room 901, 29 West 39th street, New York. Other readers are asked to bring this request to the attention of such engineers or to send information directly to the committee.

Engineering Council is an organization of national engineering and other national technical societies of America of approximately forty thousand members each member society having duly elected representatives therein, created to provide for the proper consideration of subjects of general interest to engineers and the public and for united action upon matters of common concern to engineers in all branches of the profession.

PUBLIC UTILITIES AND THE WAR.

Henry L. Doherty Explains Important Position Occupied by Central Stations at Present Time.

Henry L. Doherty, head of the Doherty organization, lucidly discusses "Public Utilities and the War" in an article recently published in *The Spur*. He refers to the difficulties with which public utilities are faced, and believes the needed relief will come as the result of a growing appreciation on the part of the public of the value of the service rendered by the companies. The public, having established its right to have public utility charges reduced when they are unfairly high, will gradually give consent to have them increased when they are unfairly low. He thinks the people, the patrons of public utilities, are realizing their dependence upon these utilities for many necessities and comforts, and are ceasing to regard them as mere profit takers.

Mr. Doherty makes the statement that the great majority of customers of a gas or electric plant never have paid as much as the expense they occasioned, and he thinks the stress of existing conditions should result in adopting a method of charging each customer a rate based upon the cost of the service rendered him. He takes the position, moreover, that charges for current or gas should be based not alone upon the amount consumed, but on the rate of supply and demand by each customer; that companies should refuse to give service as a matter of convenience to the customer.

He takes a fling at the power user who generates

his own power as long as his supply of coal lasts, and then draws upon the central station for current, simply paying for the amount used. His companies, he states, will make an insistent demand to be allowed to apply the readiness-to-serve method of charging for electric and gas service. In other words, he demands that the companies be paid for service, aside from the electricity and gas they furnish.

Relative to the operation of electric street railways, he refers to the power business which has been developed by street car companies, and emphasizes the fact that an opportunity exists for developing the freight-handling business. The problem of congested traffic in large cities, Mr. Doherty believes, can be solved most expeditiously and most economically by the street railway companies; and eventually street railways are destined to become the principal carriers of freight in cities. Some comparisons are made of the economy and facility of street car freight haulage and those of motor trucks and horse-drawn vehicles.

The matter of street car passenger fares is next taken up. He characterizes as absurd the practice of charging the same fare for ten miles as for ten blocks; and then lays down the premise that charges for fares should be based upon distance. He thinks the alleged difficulties in the way of establishing a system of fares based on distance are largely imaginary. He indicates that a rational distance system of charging will prove mutually beneficial to both public and railway companies. In the working out of this system the result will be to eliminate congestion.

The antagonistic legislation and regulation aimed at railway companies have reacted upon the public served, and similar treatment of utilities will bring results of the same kind. The public, for its own good, should demand fair treatment of public utilities.

REFERENDUM VOTE ON WATER-POWER POLICY INAUGURATED BY U. S. CHAMBER OF COMMERCE.

Expression of Opinion Asked from Leading Manufacturers for Guidance of Legislative Committee.

The United States Chamber of Commerce, Washington, D. C., has taken steps to secure a referendum vote on proposed water-power legislation from the members of the 985 commercial organizations of the country which stand back of the national chamber. The object of the questionnaire sent out is to obtain a consensus of opinion as to what legislation, if any, Congress should enact to encourage the development and use of the nation's unused water-power resources; and as to the industrial practicability of such power projects, and as to whether it is possible to make them attractive to capital and at the same time secure adequate protection to the public.

Members of the commercial bodies are asked to vote either for or against a series of recommendations, accompanying the numerous general questions, which were prepared by a special committee of the national chamber. These recommendations are positively favorable to certain proposed legislation designed to encourage and promote hydroelectric projects. It is made clear, however, that this committee report speaks only for the members of the committee who signed the recommendations; that neither the chamber as a whole, nor its board of directors, is committed to either side of the question. The report and recommendations are as follows.

"That federal legislation encouraging the development of water powers should be at once enacted."

"As to all developments, whether within or outside the public domain, a separate act of Congress should not as at present be required for each development, but the authority to issue permits should be vested in some department or commission designated for that purpose and under conditions protective of the interest of the public and of the investor."

"Permits should be issued for a period of at least 50 years, unless at the option of the applicant a shorter period is agreed upon, and should be irrevocable except for cause."

"A toll should be imposed by the government only on power developments on the public domain or benefited by head-water improvements maintained by the government. Such tolls should be based upon the horsepower actually developed, used and sold. The tolls should be reasonable, and proportionate to the benefits derived."

"If public lands form only a small and incidental part of the entire development, the licensee should be entitled to acquire the right to use such lands, paying the government fair and just compensation for such use."

"At the expiration of the license period the government should have the right to recapture the property for itself or for a new licensee upon the payment of fair and just compensation for the property and for all dependent property, if taken; and if the dependent property is not taken, then fair and just compensation should be paid for all severance damages. Provision should be made that, all things being equal, the original licensee have priority over any new licensee."

"No element of the proposed legislation," comments the report, at this point, "is more vitally important than the terms upon which the property of the permittee may be taken from him at the expiration of the permit. If he cannot be assured that in case his property is taken he will receive 'just compensation' therefor, he will invest his money in other enterprises. The words 'just compensation' carry an assurance of protection and fair dealing, and a sense of security. Any attempt to amplify or limit 'just compensation' by definitions and refinements of 'fair value,' 'original cost' and other expressions upon which there are various theories now under discussion and as yet undefined by the courts leads to uncertainty which is the one thing which must be avoided. All these mooted technicalities will be settled by the courts and the commissions long before any of these permits terminate. It is difficult to see why either the public or the investor should not be satisfied to rely upon the expression 'just compensation' and trust to its interpretation and application by the federal courts in the light of public opinion as it shall be reflected in the law fifty years in the future."

"At the expiration of the license period the government should (1) agree with the licensee as to the terms of a new license, (2) recapture for itself for a new licensee, (3) continue the license under the original terms."

"Rates and service should be regulated by state commissions where the service is intrastate, and only by federal authority where the service is interstate and the commissions of the states which are directly concerned do not agree or there is no state commission. The exercise of any federal jurisdiction over the issuance of securities would be unnecessary and unwise."

"No preference should be allowed as between ap-

plicants, whether a municipality or otherwise, which amounts to the granting at the expense of the government of a subsidy creating unequal competition in the same market."

The membership of the U. S. Chamber of Commerce special committee, which authorized recommendations above is as follows:

L. S. Gillette, chairman, engineer and manufacturer, Minneapolis; Harry A. Black, wholesale merchant, Galveston; Rome G. Brown, lawyer, Minneapolis; Henry S. Drinker, president, Lehigh University; Frank P. Glass, editor, Birmingham News; E. K. Hall, lawyer, New York City; Horace C. Henry, retired railway contractor, Seattle; Henry L. McCune, lawyer, Kansas City; Samuel V. Stewart, lawyer and banker, Virginia City, Mont., and governor of Montana; George F. Swain, civil engineer, Boston; and C. F. Weed, lawyer and banker, Boston.

NOVEMBER ELECTRICAL EXPORTS CLOSE TO RECORD TOTAL.

Total Shipments Valued Over $5,370,000 and Exceeded Only by Exports in June.

Another spurt in export of American electrical products occurred last November, as disclosed in the statistics on the foreign commerce of the United States for that month just made public by the Bureau of Foreign and Domestic Commerce, Washington, D. C. Electrical shipments came within 8 per cent of the extraordinary record total established last June. The November total represents an increase of nearly 20 per cent over the electrical exports of the corresponding month in 1916.

In the following table are given the detailed figures for last November and for November of the preceding year:

Articles.	Nov., 1917.	Nov., 1916.
Batteries	$ 409,968	$ 306,005
Carbons*	94,699	.....
Dynamos or generators	164,179	182,653
Fans	33,361	21,169
Heating and cooking apparatus*	48,596	.....
Insulated wire and cables	713,533	725,503
Interior wiring supplies, including fixtures	241,265	55,069
Lamps—		
Arc	732	731
Carbon-filament	7,541	14,492
Metal-filament	285,814	121,623
Magnetos, spark plugs, etc.	433,704	.....
Meters and measuring instruments	128,869	76,272
Motors	621,845	410,211
Rheostats and controllers*	10,783	.....
Switches and accessories*	219,302	.....
Telegraph apparatus, including wireless	24,099	54,562
Telephones	228,554	189,923
Transformers	271,016	72,496
All other	1,436,257	2,188,826
Total	$5,374,117	$4,421,535

*Not separately listed prior to July 1, 1917.

Conclusive evidence that the year 1917 has been the best year in the electrical export trade of the country is obtained from the following totals covering the 11-month periods ended November 30 in each of the last three calendar years: 1917, $49,751,702; 1916, $35,497,238; 1915, $22,164,250.

Stevens Institute to Open Evening School for Radio Operators.—The Stevens Institute of Technology, Hoboken, N. J., is planning for the early opening of a free evening class for the purpose of training men as radio operators for the Signal Corps, United States Army. Prof. L. A. Hazeltine, head of the department of electrical engineering, will conduct this course.

DETAILS OF MIAMI CONSERVANCY PROJECT.

Work to Begin in Spring—Construction of Dams and Channel Improvement Will Require 5000 Horsepower in Electric Motors.

The Miami Conservancy District, Dayton, Ohio, developed plans in 1916 for the construction of earthen dams, levee embankments, concrete retaining walls and revetment, and making river channel excavations, to protect Dayton and other cities in Miami Valley from a recurrence of the disastrous floods which came in 1913.

The maximum cost of the entire project was estimated at $23,750,144, which included not only the cost of actual construction, but that of public service locations, damages, real estate purchases, administration and contingencies. The bonds issued by the district have been sold, and $10,000,000 of the proceeds of such sale are understood to be available at this time. It is proposed that actual construction be commenced by April 1, 1918, and it is estimated the entire project will be completed within three years from that date.

Extent of Project.

The Miami drainage basin covers an area of 4000 square miles in the southwestern part of Ohio, drained by the Miami River and its tributaries. The cities and towns seriously affected by the flood of 1913 are Dayton, situated at the confluence of the Mad, Stillwater and Miami Rivers; Hamilton, Middletown, Miamisburg and Franklin, all on the Miami below Dayton; and Troy and Piqua on the Miami above Dayton. These river channels are comparatively shallow and narrow, and at times of excessive rainfall, as in 1913, the runoff volume far exceeded the capacity of the regular channels to carry it away. In fact, measurements show the Miami channel, in some places, of sufficient capacity to carry only 10 per cent of the flood waters in March, 1913, which caused the loss of 400 lives and the destruction of property valued at $60,000,000.

Electrical Features.

Features of electrical interest in connection with the proposed work are interesting and important. Electrically operated pumps, drag-line excavators and hydraulic dredges, it is estimated, will require motors of the aggregate capacity of over 5000 horsepower. Plans contemplate operations at the five different dams at the same time and also on channel and levee work. It is understood the electric energy will be supplied by Dayton Power & Light Company at ½ to 2 cents per kilowatt-hour. Current will be delivered at 6600 volts to a transformer at each of the five centers of operation, where it will be stepped down to the requisite voltage for motor drive. In dam construction, while much work will be done by drag-line excavators and hydraulic dredges, a considerable amount of material will be moved by sluicing and pumping. That is, a station of 12-inch centrifugal pumps, each operated by a 200-horsepower direct-connected motor, will force water from the river through pipe lines terminating in hydraulic giants, playing against gravel banks, and washing the material down into sumps. The water in the sump, carrying 10 to 15 per cent sand, gravel and silt, will be delivered upon the dam through a pipe line by 12-inch and 15-inch dredging pumps, operating against a head of 30 to 100 feet. In the case of the greater lift, there will be booster pumps on the line,

the discharge of one entering the suction of the next. All such pumps will be direct connected to motors of 200 to 250 horsepower. The sand and gravel pumps will be capable of handling 8 cubic feet per second. Alternating current, 3-phase, 60 cycle, will be used at 2200 and 440 volts. The district is now purchasing motors, pumps, transformers and other necessary equipment.

The district, at a recent date, was in the market for the following electrical equipment: Forty-five alternating-current, 60 and 25-cycle motors of 2200 and 440 volts, of the combined capacity of about 5200 horsepower. In this requirement both slow speed and high speed motors are desired. Also, 10 transformers, 6600/2200 volt, 60 cycle, 100 to 200 kilowatts, single phase; and 10 transformers, 6600/440 volts; 10 of 33,000/2200 volts, and 10 of 33,000/440 volts, all 25 cycle, 100 to 200 kilowatts, single phase; and 10 small transformers of 2200/110 volts. Present pump requirements consist of 10 centrifugals, 4-inch, 6-inch and 8-inch discharge, for operating against a head of 50 feet; all of these are for direct-connection to alternating-current motors, 60 cycle, 3 phase, 2200 or 440 volts. Other equipment to be purchased, and intended for motor drive, consists of three air compressors, five slack-line cableway excavators, 15 concrete mixers, 15 drag-line excavators, 20 drills for rock work and exploration, 12 revolving screens.

The engineering staff of the district is as follows: Arthur E. Morgan, chief engineer; Chas. E. Paul, assistant chief engineer; C. H. Locher, of the firm of Grant Smith & Company & Locher, Bristol, Va., will be superintendent of construction. Division engineers, in direct charge of work at the several dam sites, are thus announced: H. S. R. McCurdy, Englewood dam; A. B. Mayhew, Germantown dam; B. M. Jones, Lockington dam; O. N. Floyd, Taylorville dam; C. C. Chambers, Huffman dam; J. H. Kimball will supervise channel improvements at the several locations; C. A. Rock and C. H. Eiffert will be assigned to other phases of work at Dayton and Hamilton. W. M. Smith, designing engineer, formerly with Panama Canal Commission, is a member of the staff.

The fact that all dam sites are widely separated from each other makes it necessary to have at least five centers of operation where electric power will be required. The Germantown dam, the farthest one south, and the Lockington dam, the farthest north, are about 50 miles apart.

Demand for Small Motors in India.—The Indian Textile Journal expresses surprise that no foreign firm has yet thought it worth while to open up in Bombay a demonstration of electric motors for miscellaneous industrial purposes, including small cotton and grist mills, printing presses, elevators, and brass and woodworking machinery. It voices the opinion that the local producers of electrical energy would be interested and glad to co-operate with such a project, if promoted on the ground. Motors of medium grade and cost would probably be best suited to the market. Hitherto the United States has not had a very large share of the Indian trade in electrical accessories, except in the line of fans, but the war has changed conditions materially and previous British sources of supply have been largely cut off.

Executive Committee of National Association of Electrical Contractors and Dealers.

The National Association of Electrical Contractors and Dealers was launched in St. Louis, Mo., on January 22 and 23, at which time the new executive committee met and formally adopted the new constitution. In the above group are the members of the executive committee and James R. Strong, Ernest McCleary and William L. Goodwin, who comprised the committee which drafted the new constitution.

NEWS NOTES

Trenton Engineers' Club Holds Monthly Meeting.—At the recent monthly meeting of the Engineers' Club, Trenton, N. J., an interesting lecture was delivered by Charles Penrose, of Day & Zimmerman, Philadelphia, Pa. The subject of Mr. Penrose's lecture, which was illustrated, was "The Power Company and the Distribution of Electrical Energy."

Electric Trains in Rocky Mountains Shown in Moving Pictures.—Chicago Chapter of American Association of Engineers held a meeting at Lumbermen's Association rooms, at 11 South La Salle Street, the evening of January 18, the program for which was for railroad engineering circles. A feature was an address by Anthony Czarnecki, who was a correspondent for Chicago Daily News in Poland. General Electric Comany's new film, showing the Chicago, Milwaukee & St. Paul Railway's electric trains operating in Montana, was presented.

Business After the War.—The Jovian Electric League of Kansas City, Mo., at its monthly meeting January 25, heard from H. P. Wright, president of the H. P. Wright Investment Company, an inspiring statement of the prophecy of a business man as to the character of change in industry that is to follow the war—if the United States is among the winners of the war. Mr. Wright said that the United States represents the idea of Service, as opposed to the principle of Greed as exemplified by Germany; that when the soldiers return from Europe, after winning this war for civilization, they will not allow business to proceed on any other basis than a basis of Service, and that Greed, by corporations, public, or labor unions, will have to be eliminated.

Kansas State Electrical Society Elects Officers.—At the tenth annual meeting of the society recently held at the University of Kansas Con H. Buck, of Topeka, was elected president of the organization; Dean A. A. Potter, of the State Agricultural College at Manhattan, vice-president, and L. B. Smith of Topeka, secretary. The social aspect of electricity was the subject of most of the papers read, the most notable among these being that presented by Prof. F. E. Johnson of the university who told how since 1910 there has grown up in Kansas a score of independent and municipal firms that were supplying electricity to a string of towns and to many farmers, thereby adding a modern convenience that was making life still more worth living in many rural communities.

United Engineering Society Elects Officers.—At the annual meeting of the trustees of the United Engineering Society, held January 25, the following officers were elected for the ensuing year: President, Charles F. Rand, a member of the American Institute of Mining Engineers; first vice-president, Calvert Townley, a member of the American Institute of Electrical Engineers; second vice-president, Robert M. Dixon, a member of the American Society of Mechanical Engineers; treasurer, Dr. Joseph Struthers, a member of the American Institute of Mining Engineers; secretary, Alfred D. Flinn, a member of the American Society of Civil Engineers, and chairman of the Finance Committee, J. Vipond Davies, a member of the American Society of Civil Engineers.

Ecuador and Peru Favor American Electrical Goods.—America's opportunity of increasing its sales of electrical goods in Ecuador and Peru during the absence of German competition is pointed out in a report made public by the Bureau of Foreign and Domestic Commerce, of the Department of Commerce. Before the war this trade was divided between Germany and the United States, the advantage being with the American manufacturer. The Government's report is concerned with the market as it exists today and the opportunities it offers for the future. Copies of "Electrical Goods in Ecuador and Peru," Special Agents Series No. 154, can be purchased at the nominal price of 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from any of the district or co-operative offices of the Bureau of Foreign and Domestic Commerce.

Rate Increases Discussed by Indiana Engineers.—George Hubley, general manager of the Merchants Heat & Light Company, Indianapolis, Ind., at the annual meeting of the Indiana Engineering Society recently held at the Claypool Hotel in Indianapolis, presented a paper in which he outlined the business problems which now confront the utility properties. In his paper Mr. Hubley told of the increased prices of materials extensively used by public service corporations, showing that certain commodities have increased from 20 to 200 per cent in price since industrial conditions have been changed as a result of war, and that wages also have been increased from 25 to 50 per cent without a corresponding increase in effectiveness of workers. The subject of rate increases was discussed by representatives of public service corporations of Indiana, who in their addresses predicted that if the Indiana Public Service Commission does not soon grant increased rates for service, serious results would ensue because of the greatly increased costs of operation brought on by war conditions that would affect unfavorably both utilities and public alike, the utilities first and the patrons dependent upon them later.

Iron and Steel Engineers to Hold Meetings.—The regular monthly meeting of the Pittsburgh section of the Association of Iron and Steel Electrical Engineers will be held February 15 at the Hotel Chatam, Pittsburgh, Pa. Mr. Lindquist of the Otis Elevator Company will present a paper on "Alternating Current and Direct Current Skip Hoists," which will discuss some of the methods of hoisting ore by alternating and direct current, and will call attention to some places where new economies and further simplicity have been achieved in this field. The next regular meeting of the section will be held March 16 at the Hotel Chatam. The Philadelphia section of the association will meet March 1 at the Majestic Hotel, and a feature of this session will be the presentation of a paper on "Standardized Mill Table Controllers," by John S. Rowan, of the Rowan Controller Company, Baltimore, Md., with illustrations. The Cleveland district meeting will take place February 23 in the Union League rooms of the Hotel Statler, Cleveland, Ohio, at which B. W. Gilson, of the Carnegie Steel Company, Youngstown, Ohio, will deliver a paper on "Generation, Distribution and Consumption of Power." A joint technical session of the American Institute of Electrical Engineers and Cleveland district section of the Association of Iron and Steel Electrical Engineers will be held on the evening of March 8, a complete announcement of which will be made later.

Operating

System Interconnection—Oil-Immersed Strain Insulator—Transformer Bank Mounting—Rotary Wrecks Itself

INTERCONNECTION OF SYSTEMS MAKES RAPID PROGRESS.

Large Western Utilities Connect Up Their Systems on Large Scale.

The interconnection of generating stations and transmission lines is progressing steadily in the West as the need for making available equipment and capacity otherwise not fully loaded, conserving oil and utilizing every feasible economy become better realized.

A world's record, it is believed, will soon be made when the vast network covering almost the entire portion of Southern California will be interconnected and the three operating companies become tied-in together, the equivalent of one system. The three companies are the Southern Sierra Power Company, the Southern California Edison Company and the San Diego Consolidated Gas & Electric Company.

Further north the Great Western Power Company, Sierra & San Francisco Power Company, and the Pacific Gas & Electric Company have unified their systems already, for the duration of the war and possibly afterward. This amalgamation comprises altogether some 40,000 square miles of territory and includes 38 counties of Central and Northern California.

Interconnection has also gone ahead to successful conclusion further north and is still making steady headway. The Pacific Power & Light Company recently connected up with the Washington Water Power Company by constructing a 110,000-volt transmission line 65 miles at a cost of about $600,000. This line connects between Pasco and Lind. Another transmission line is at present in course of erection by the Pacific Power & Light Company, between Powerdale on the Hood River and the Salmon River plant, which when completed will tie in its system with that of the Northwestern Electric Company. When actually in use this line will connect in a ring system the systems represented by the Pacific Power & Light Company, the Portland Railway, Light & Power Company, and the Northwestern Electric Company.

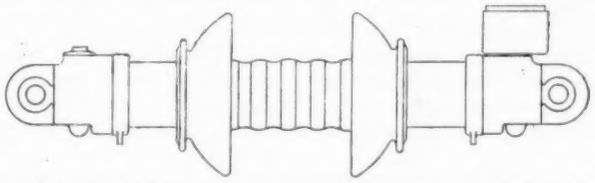
Still further to the north the Washington Water Power Company is already connected up with the Montana Power Company to the east and will shortly be tied in with the Puget Sound Traction, Light & Power Company to the west. When this latter section is completed there will thus be a direct interconnecting link between Eastern Montana, across Idaho to Seattle and Portland.

Throughout these unified systems every endeavor will be made to shut down steam generating plants and utilize water power in its place. It is expected that many thousand gallons of oil can thus be saved, as well as coal and natural gas, without affecting service in any way. Moreover, operating economies will, it is believed, prove the efficacy of unified systems in times of peace as well as during war.

SALIENT FEATURES OF HIGH-VOLTAGE OIL-IMMERSED STRAIN INSULATOR.

Details of Insulator Designed for 120 Kilovolts and 35,000-Pound Loading Comprise Expansion Chamber, Oil Insulation and Wood Strain Blocks.

In the issue of the ELECTRICAL REVIEW of February 2 appeared a description of the 190-foot steel towers on each side of the Maumee River that will carry four 3-phase, 60,000-volt circuits and three grounded



Wood-Core Strain Insulator for 35,000 Pounds Loading, and 60,000 Volts.

overhead conductors with a span of 1300 feet, when the Acme Power Company's East Side station connects up with the Water Street station of the Toledo Railways & Light Company. In that article mention was made of the insulators that will be used, it being there pointed out that the load carried by the insulators will be considerable, and to meet the situation, the Ohio Brass Company had designed a special oil-immersed insulator of rather unique design. The voltage on the insulators will, eventually, be 66,000 volts, and the load carried by each insulator will approximate 6000 pounds.

So much interest has been aroused as to the details of this insulator that permission has been obtained from the Ohio Brass Company to publish a few of the salient features of design. The insulator is specified as Drg No. 11018 and is patented.

The insulator is made up of two heavy wooden members which are connected together by an end casting of special design, and so arranged that the stresses between the wooden members are at all times equalized whilst the grip of the end castings increases with increasing tension. A porcelain jacket or sleeve, equipped with two integral flanges, surrounds these wooden members. This porcelain sleeve is never under tension, however, and acts as a container for the oil or compound with which the insulator is filled and is designed to keep the flash-over on the outside. A reservoir is provided to take care of the expansion and contraction of the oil or compound under varying temperatures. This reservoir can be seen at the right in the sketch. The joint between the porcelain sleeve and the end casting is flexible so as to allow for unequal expansion and contraction and yet is so designed that leakage of oil or compound cannot occur under the most extreme variations of position.

The insulator is essentially a high-voltage insulator adapted to long spans and exceptionally heavy

loads. The insulator shown in the sketch measures more than 4 feet over-all, the larger insulator petticoat having a diameter of 15 inches. This type of insulator is now being built for 120,000-volt service and to carry continuously loads of approximately 35,000 pounds.

INFLUENCE OF WAR CONDITIONS UPON UNDERGROUND CONSTRUCTION.

Commonwealth Edison Company During Last Year Pulled Up and Relaid Some Ninety Miles of Underground Conductor.

It is generally appreciated that material is difficult to obtain under any conditions, and that immediate deliveries are usually out of the question. Embargoes, congested traffic and overworked factories are the causes usually advanced. While these facts are generally recognized, few outside of these directly concerned appreciate the manner in which such conditions affect public utility growth and the cost of doing business.

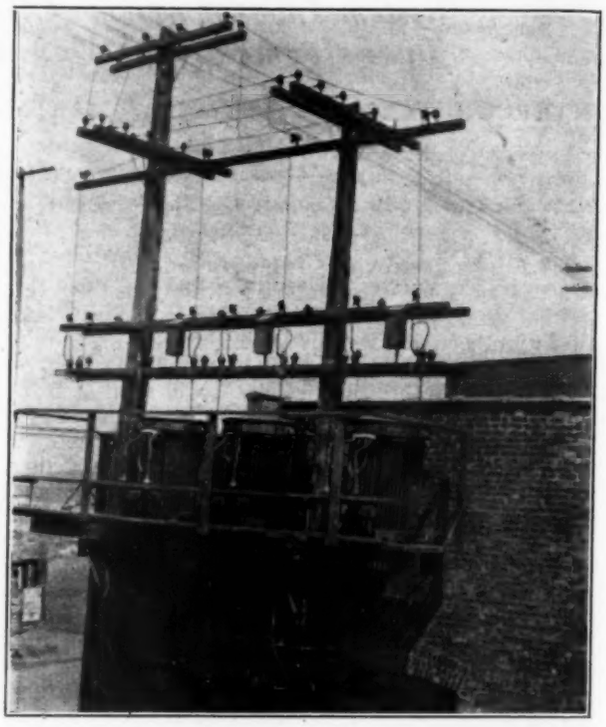
Speaking of the work of his department, D. W. Roper, superintendent, Street Department, Commonwealth Edison Company, recently brought to light some interesting facts regarding the cost to which his company has been occasioned on account of having to utilize existing cables already laid down instead of being able to order and obtain more on short notice. It appears that the work of the Cable Division of the Street Department comprised some 40 per cent more cable in 1917 than during the previous year. Actually, very much more work was entailed because a large portion of the new installations consisted of cable that had to be pulled up from one location and relaid where most needed. The work occasioned by pulling out cable already laid is about twice that of laying new cable. Some 90 miles of three-conductor transmission cable and four-conductor 60-cycle feeder cables were thus removed from one location and pulled in ducts in another.

SAFE AND RELIABLE MOUNTING FOR TRANSFORMERS.

The concentration of large loads, the need for serving loads cheaply and on short notice by overhead lines instead of underground, the safety movement and similar reasons dealing with safety, economy and reliability always make outdoor installation of linework and transformers of interest. The installation shown is a large and important installation of pole type transformers, that while compact accomplishes practically everything in the way of safeguarding linemen, equipment and service quite simply.

The transformers are connected to the primary lines through lightning arresters as shown. The arrester in each phase being on the same pole and very near the transformer, gives maximum protection. Immediately below the lightning arrester comes the pothead, which is of the disconnective type, thus permitting quick isolation of any one or all of the transformers in times of emergency or for locating trouble. Note that the linework is of the simplest, duplication is minimized and there is no needless array of conductors to cause accidents, short-circuits and trouble generally.

It can be seen that the installation is four-wire three-phase, the transformers being connected star on the high-voltage and in delta on the low-voltage side. As can be seen, the installation shown consists of one transformer bank served by one four-wire three-phase circuit. It would be a very simple matter to supply the transformers by an additional circuit where desirable, using only three arresters as at present or by



Transformer Mounting for Installation of Large Pole Type Transformers.

installing another set for the additional circuit. For minimum cost one set of arresters and one set of potheads would be used, the arresters then being placed between the potheads and transformers, and the primary buses would be brought down where they are more easily handled. The potheads would, moreover, have two stationary elements, one to the corresponding phase of the different buses or circuits. The movable element of the pothead connects to the transformer.

The linemen are protected from falling by a solid railing built around the platform upon which they stand, thus permitting of safety and at the same time enabling a lineman to devote his attention to the arresters, potheads or whatever work is on hand without distracted attention. To make the platform accessible easily and reduce the possibility of the men slipping and falling when climbing over the pole to platform, a galvanized steel ladder is installed at the one pole, as shown. A space is left in the floor of the platform, thus enabling the lineman to crawl easily and safely through with a minimum of risk.

Polishing Meter Jewels Proves Economical.

Meter jewels are not only of higher price than before the war but are less abundant and in many cases of lower grade. It will be a good policy therefore to conserve the supply of meter jewels on hand, and sapphires especially.

Many companies have been in the habit of dis-

carding jewels taken out of meters because worn and pitted with pivot holes, disposing of them as junk. This is a wasteful habit and one to be particularly deprecated at this time when imports are largely curtailed and the limited supplies from Montana and other home markets have to be used. Before throwing out meter jewels, and this applies to sapphires especially, a microscopic examination should be made to determine if sufficient stone remains to justify regrinding. Often the jewels may be reground and polished at a cost of less than half the price of new jewels. Tests seem to show reground jewels are as satisfactory as new ones, so far as meter operation is concerned.

RUNAWAY ROTARY WRECKS ITSELF.

Recent Accident Proves the Best Apparatus Is Not Entirely Infallible.

A case of operating trouble recently occurred that goes to remind one that even the best apparatus and the highest class of supervision do not necessarily eliminate accidents. Moreover, the incident goes to prove that operating personnel is important even where everything in a station is automatically controlled.

A rotary converter substation containing some 8000 kilowatts of rotary converters was carrying the heavy load such as occurs around 5:00 p. m. when one of the underground alternating-current supply lines from the generating station broke down. The circuit breakers between this line and the rotaries it had been supplying opened automatically, and thus the rotaries were cleared from the fault. However, instead of the direct current breakers also automatically opening, as they should, on one machine they remained closed. The unit thus tied in on the direct-current side with the alternating-current side open immediately began to pick up speed, running as a series direct-current motor. In the ordinary way even if the breakers in the direct side did not operate from reverse current the over-speed device should operate them when a predetermined speed was attained.

In the present instance, however, the breakers remained closed. The over-speed device operated, as was afterwards proved, but the direct-current supply for operating the breakers was too low to operate them. The source of this direct-current was the direct-current bus of the Edison 3-wire system, and its pressure was low because of the loss of capacity in the station in trouble. An emergency source of supply from a storage battery was available in case of some such occurrence, but time prevented the over-speed apparatus being cut over to it. The result was that within a few seconds the machine had attained a terrific speed, and exploded under centrifugal force. The armature yoke, which weighed some five tons, was thrown out on to the concrete floor, through which it hewed its way to the room below. The cast iron spider carrying the commutator fractured close to the hub, and spider, commutator bars and armature coils were scattered over the station. The force was so intense that heavy pieces of metal were hurled through the station walls and ceiling. Two rotaries, one on each side of the destroyed unit, were also seriously damaged by flying debris, their armatures suffering most.

Fortunately, the operator was unhurt. The damage done consisted of one 1000 kilowatt unit being destroyed, two units seriously damaged and considerable damage to the station. The incident emphasizes that compact stations with units in very close proximity have their disadvantages; that even where the most complete equipment for manual or automatic control is installed the unlikely may happen; and that while automatic devices may advantageously replace the erratic human element in many cases, the personal equation is the all-important factor in urgent emergency.

FORCED COOLING INCREASES CAPACITY.

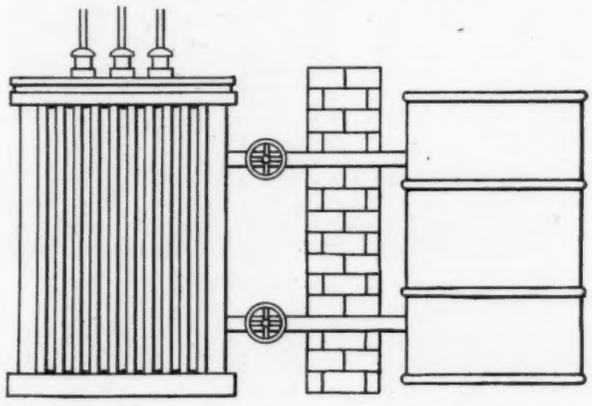
By H. E. Wagner.

In a recent issue of the Electrical Review it was pointed out that the circulation of oil as well as water in oil-filled apparatus would extend the capacity of apparatus for carrying continuous load. Increasing the quantity of oil contained in a transformer case would increase the current carrying capacity, in the same way that increasing the cooling surface would increase the rate of heat dissipation.

In the sketch is shown a method that may be employed with advantage in some instances, especially where internal room temperatures are abnormally high. In the sketch an ordinary oil drum is shown, but a radiator can also be used to advantage. The oil drum should, of course, be located as close as possible to the transformer, and the connecting pipes be of relatively large cross section and preferably be covered with heat insulating material, both being to minimize restrictions to oil circulation.

The arrangement shown is equivalent to increasing the size of the transformer case, although somewhat less than were the oil in the case itself, perhaps, because although the cooling surface is increased, there may be retarded oil flow due the pipes.

For installations of the vault type where the ambient temperatures may be high seasonally, where for a number of possible reasons few outlets or inlets for air are permissible and attention is infrequent, the above arrangement may be worth while. It is very cheap, not susceptible to mishaps, and once in effect



Arrangement of Auxiliary Oil Supply for Oil-Filled Transformers.

remains so. If climatic conditions are severe it may be a wise measure to install valves as shown, to permit disconnecting the auxiliary oil supply during the cold weather and draining off that in the oil drum. The above arrangement should not be used where fire risks are of importance unless means are available for protecting the oil drum against malicious interference and disposing of the oil. Its efficiency depends upon the freedom of oil circulation.

Commercial

Electricity Speeding Up Farm Work—Appliances Save Fuel, Food and Labor—Other Central-Station Notes

ELECTRICITY SPEEDING UP FARM WORK IN IDAHO.

Advantages of Power and Light Shown—Comparative Cost Data Based on Normal Conditions.

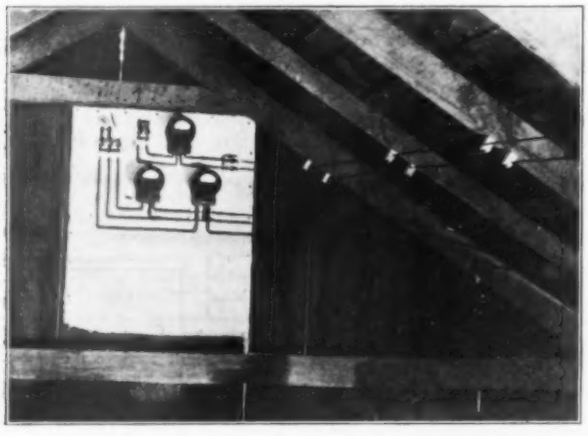
By C. O. Crane.

Engineer, Idaho Power Company.

The field for the application of electricity has hardly more than begun to develop in the United States as a whole. Central stations are now supplying in the neighborhood of 75,000 rural customers.

The farmer is one of the greatest of all users of water power of various kinds, but he still clings to such primitive methods as hand labor, horses and mules.

The substitution of machinery for hand and animal labor has resulted in many notable reductions in both time and cost of producing and handling the output of the farm. For instance, the time required to produce a bushel of wheat from the shock has been reduced from an average of 3 hours and 3 minutes at a cost of 20 cents to 9 minutes and 18 seconds at a cost of 10 cents.



Service, Cutout and Meter Board in Farm Building.

In 1855 it required 4 hours and 34 minutes labor to produce a bushel of shelled corn, while in 1894 the average time was reduced to 41 minutes. In the year book of the Department of Agriculture in 1899 it is stated that it formerly required 11 hours of manual labor to cut and cure a ton of hay, whereas the same work is today accomplished with the aid of machinery in 1 hour and 39 minutes, the labor cost being reduced from 83 to 6 cents per ton.

Not only has the use of farm machinery reduced the cost of farm products but it has also been an aid in improving their quality, due to the scientific methods of planting and harvesting, which it has rendered possible. The increasing adoption of machinery is due to a realization of both its efficiency and economy when compared with manual and animal labor, combined with the growing difficulty of obtaining competent and sufficient help on American farms.

It is commonly assumed that it takes 10 men to exert one horsepower or 13 men to exert one kilowatt. If a man's time is worth 15 cents per hour, his services would then cost about $2.00 per kilowatt-hour.

It requires one man or one-eighth-horsepower to run a cream separator. A one-eighth-horsepower motor at 12 cents per kilowatt-hour would cost only 1⅛ cent per hour to operate. Man power is thus about 16 times as expensive as electric power at 12 cents per kilowatt-hour and 32 times as expensive as 6-cent electric power, which is the prevailing power rate in southern Idaho.

A gasoline engine costs about twice as much as a motor, usually weighs about 2 or 3 times as much, occupies much more floor space, is noisy, more subject to trouble and requires more skill to operate and has several other less important disadvantages. A motor does not need a heavy foundation; it can be mounted on a timber frame and carried from place to place by two men or can be drawn about on a stone boat and is ready for service in its new location as soon as the belt and wires are attached. These illustrations are given to show the saving that can be made by the application of electric drive to farm machinery.

Electricity in the Dairy.

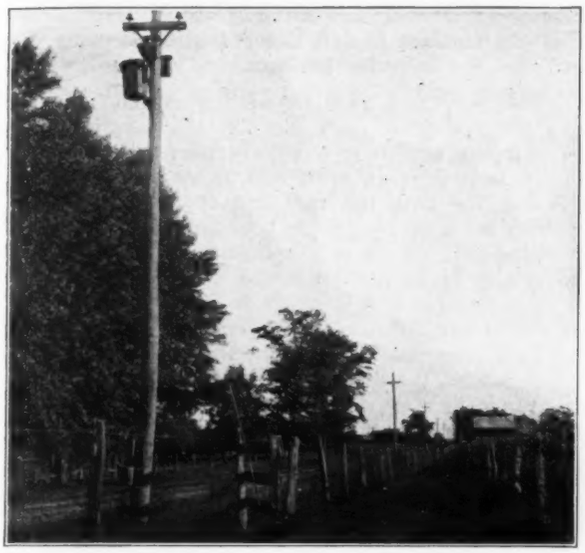
The characteristics of the electric motor render it especially valuable for the operation of the dairy department. The requirements of modern sanitation have brought the process of electric milking into common use. One person can milk 8 cows at the same time. The power required for milking one cow is about 20 watt-hours which at 6 cents per kilowatt-hour would cost 0.12 cent per cow per milking, or about 7 cents per month. For hand milking an expert can milk about 10 cows per hour, and his services, at 15 cents per hour, would thus be 1½ cent per cow per milking, or about 90 cents per month.

The electric motor can be adapted with equal success to both the barrel or factory type of churn. The results of several tests show that one kilowatt-hour will churn and work from 80 to 85 pounds of butter, which, at 6 cents per kilowatt-hour, means that churning and working 100 pounds will cost 7.5 cents.

Cream separators should be one of the first devices to be electrified. Only a one-eighth-horsepower motor is required, usually connected on lighting circuit in the dairy, and the cost of operation at 9 cents per kilowatt-hour will be less than one cent per hour.

Many perishable products on the farm are lost for the lack of cold-storage facilities. It is entirely practicable for the farmer to have an insulated room with a small refrigerator machine driven by a motor which can always keep the room at nearly the same temperature. A one-ton plant driven by a three-horsepower motor will use an average of 60 kilowatt-hours per

month, which at 6 cents per kilowatt-hour will cost $3.60. Already several of these cold-storage plants have been installed on farms in southern Idaho.



Farmers' Iron-Wire Line with Lighting Transformer.

Other dairy utensils which lend themselves to electrical operation include bottle washers, butter cutting and printing machines, cream testers, pasteurizers, etc.

Electricity in the Farm Shop.

The farmer is a large user of machinery and all machinery occasionally needs repair. The serviceability and economy of motor drive is very valuable for driving the machinery of the repair shop. Motor drive can be applied to grindstones, emery wheels, wood saws, wood splitters, hack saws, drills, forge blowers, drop hammers, glue pots, soldering irons, etc. One cent's worth of electricity at 10 cents per kilowatt-hour—

Will keep a one-pound soldering iron hot for 40 minutes.

Will keep a half pint glue pot hot for 5 hours.

Will operate the ordinary farm grindstone or emery wheel 50 minutes.

Will drive a farm forge blower for 2 hours.

Will operate a portable drill from 20 minutes to one hour, depending upon conditions.

Electric Motor Drive for Barn and Field Machines.

An important advantage in the operation of farm machinery by means of electricity is the fact that power is at all times instantly available and the operation of the machines can be safely and effectively controlled. In operating feed grinders, oat crushers, corn crackers and shellers, alfalfa mills, etc., the work requires the services of only one man and the feed can be economically ground for use as it is needed. It is therefore unnecessary to prepare and store it in quantities. The element of personal danger in operating machinery of this class is minimized by the simple and strong construction of the modern motor, coupled with the fact that it is under the instant control of the man who is feeding the machine.

The ensilage cutter is a good example of the economy obtained by the electric drive for this class of work. A machine with a capacity of 90 tons per day will use 1.38 kilowatt-hours per ton, which will cost 8.3 cents per ton, the electricity selling at 6 cents per kilowatt-hour.

A threshing machine with a 28-inch cylinder and a 42-inch separator and driven by a 15-horsepower motor will thresh a bushel of oats on 70 watt-hours at a cost of 0.40 cent per bushel.

A bushel of barley on 110 watt-hours at a cost of 0.7 cent per bushel.

A bushel of wheat on 160 watt-hours at a cost of 1 cent per bushel.

The above costs are based on electricity selling at 6 cents per kilowatt-hour. Too often the farmer loses sight of the fact that it costs him anywhere from one to six cents per bushel to haul his grain to and from the mill for grinding. With electricity selling at 6 cents per kilowatt-hour, he can grind—

Corn on the cob for 2.5 cents per bushel.

Oats for 2.2 cents per bushel.

Shelled corn for 1.6 cents per bushel.

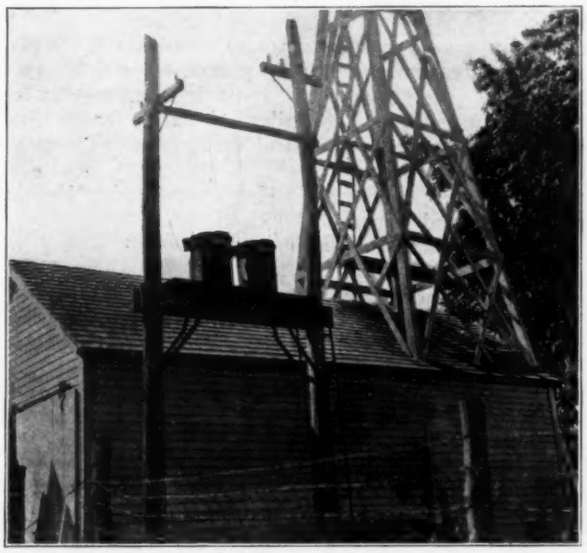
Crushed oats for 0.27 cent per bushel.

Cracked corn for 0.43 cent per bushel.

A single hole sheller with a sacker attached when driven by a one-horsepower motor requires about 25 watt-hours to shell a bushel of ear corn at the rate of 26 bushels per hour. With electric current at 6 cents per kilowatt-hour, the power cost of the operation would be 0.15 cent per bushel.

The motor-operated hay hoist is a good example of the saving which may be obtained by the use of motor drive. A hoist operated by a 10-horsepower motor will hoist and place 2450 pounds of hay in 13 minutes at a cost of 1¼ cent for power, electricity selling at 6 cents per kilowatt-hour and 10 cents for manual labor.

Root cutters for cutting up rutabagas, turnips and



Bank of Two Open-Delta-Connected Transformers.

pumpkins are used quite extensively by dairymen throughout the United States. These machines require very little power, a 2-horsepower motor being sufficient to drive a cutter having a capacity of 6 tons per hour. Electricity selling at 6 cents per kilowatt-hour, the power cost per ton would be about one cent.

Irrigation Pumping.

Irrigation pumping, from the farmer's point of view, has many advantages in that a pumping plant

would give him water just at the time he wants it, and this is a more important factor to him than the saving of the money affected. It is exceptional to be able to get water just at the time when it is wanted, when irrigating from a ditch, as ditch riders and water superintendents must serve all alike. Not only this, but when water is turned into a ditch, it must be run in quantities in order to secure economy and it is not possible that every man along a ditch will be similarly situated with regard to the progress of his work so that all will require water at any one time.

The cost of pumping water for irrigation is divided into four heads. First, interest on investment; second, power consumption; third, repairs, labor, attention and maintenance; fourth, depreciation.

In an electrically driven outfit, provided that feeder lines are anywhere in the neighborhood, the first cost is never as much as in gasoline or steam equipment of the same quality and capacity and, therefore, the interest on the investment is never higher than that charged against the gasoline and steam plant.

Figures given by the United States Government show the depreciation on the electrical equipment to be about seven per cent; gasoline equipment from twelve to fifteen per cent; and steam equipment about eleven per cent. As the gasoline and steam equipments cost more and the depreciation is larger, this means a very considerable saving in favor of electric power.

The initial cost of a pumping plant is usually much less than a ditch water right, costing only about $10 for a plant lifting water fifty feet, whereas a ditch right seldom costs less than $40 per acre and more generally about $60.

The uses of electricity in the rural districts is becoming more and more popular throughout the United States, especially in the West, where the cost of fuel is high. We have a very good example of the uses of electricity here in southern Idaho where there are now 104,000 acres under pumping plants, of which 53,000 acres are in cultivation, requiring approximately 10,000 horsepower, 548 miles of rural feeder lines serving a total of 2070 rural customers. There are now—

1770 rural customers using current for lighting residences and farms.
273 for domestic power.
312 for irrigation.
18 for grinding feed.
130 for cooking and water heating.
80 for washing machines.
1220 for flat irons.
1060 for some of the other labor saving domestic appliances.

Electric Ovens Used Extensively in Cleveland.

At the meeting of central-station new-business men held in Dayton, Ohio, on January 16, there was a discussion on low-temperature industrial heating following a paper on this subject presented by Dwight D. Miller, of the Society of Electrical Development. C. D. Carlson, of Cleveland, Ohio, said that in that city there are at present 40 electric japanning and other industrial ovens in use. These vary in rating from 15 to 212 kilowatts and are being employed for some twelve different purposes as follows: Stove parts, automobile parts, wrenches and other tools, vacuum cleaners, wooden handles, toys, multigraph parts, jobbing and armature-coil baking, drying lime on wire, shrapnel-varnish baking, and metal furniture.

SAVE FUEL, LABOR AND TRANSPORTATION BY USE OF ELECTRICITY.

Household Devices and Electric Ranges Offer Central Stations and Dealers Exceptional Opportunity for Business.

The two most vital national questions today are (1) the saving of food and (2) the saving of fuel. In carrying out these two very necessary programs, the housewife is an important factor as it would be possible for both the fuel and food shortage to be entirely made up by proper economies in our domestic consumption of these commodities. Naturally the housewife is keenly interested in co-operating with the government and is ready to adopt such measures as will accomplish the desired end.

This situation has brought to public attention, as never before, the domestic electric appliance and electric range, as it is possible with these agencies to effect the necessary savings and at the same time enjoy greater convenience and comfort than heretofore.

In the aggregate, householders use thousands of tons of coal to heat flat irons and perform cooking operations that could not only be done more cheaply with electrical devices, but would also result in savings in labor and time. Savings in food are accomplished by electric ranges because of the much less shrinkage of food when electrically cooked and when table devices are used there is much less food used because only enough is cooked to meet the immediate demands.

The opportunities for the sales of appliances were never better and in taking advantage of them central stations and dealers have the satisfaction of knowing that they are engaging the practical patriotism.

Commercial Electric Cooking.

Electric cooking and baking on a commercial scale offers a broad and prolific field which as yet is practically untouched and to which the application of electric heat can be readily adapted with mutual advantage to the customers and central stations.

Like the iron, electricity for cooking found its first application in the home, for domestic use. Its advantages soon became so apparent that there are at present something like 25,000 ranges in use today on 100 central-station lines. While figures for the grand total for the country are not at yet available, electric cooking should show greater economics when used on the larger scale for commercial purposes. This has been substantiated by results obtained from such installations which already have been made, and follows naturally from the general proposition that if process has merit per se, the advantages possible to be obtained from its application will be increased the larger the scale on which it is used.

It is interesting to note that against 10,670 places with electric service there are only 2172 towns listed in Brown's directory as having artificial gas distribution and 1373 with natural gas.

The Society for Electrical Development has on file reports from over 4800 communities where rates for heating and cooking are five cents or less, at which rate the use of the range becomes feasible and practicable. Of this number over 70 per cent are four cents or less.

P. W. Gumaer says there are three objects of cooking—

(1) To render food more digestible.

(2) To render it more appetising by improving its appearance and to develop new flavors in it.

(3) To sterilize it to some extent so that it will keep longer.

Up to the present time the main drawback against which a cook must contend is lack of adequate and sure means of controlling the temperature of the source of heat by means of which the food is cooked. With wood or coal fires the degree of heat is controlled chiefly by dealing with the food itself rather than by regulating the heat at the point of combustion. It is necessary to constantly watch and stir the food or change the position of the vessel on the stove or in the oven. All this not only consumes much energy in the form of the great many unnecessary steps taken but also necessitates that the cook shall stand for many hours at a time in a hot, enervating atmosphere.

Protein, starch and fat are the most important chemical constituents of the various foods. The heat effect on the proteins is to coagulate it. This change occurs at approximately 167 degrees, Fahrenheit. If the temperature is much above this, the protein tends to shrink and harden. The digestibility of the food of which it is a part, is proportionately lessened. For instance if an egg is cooked for ten minutes in water considerably below the boiling point at say 167 degrees Fahrenheit and compared with one cooked in the ordinary way in boiling water, it will be found that the albumen of both is solid throughout, but in the case of the former it will consist of tender jelly, rendering it more digestible and appetising, while in the latter case, the albumen is dense and almost leathery. In the same manner roast beef, by subjecting it to high heat on both sides at once for a short period becomes seared, so that it will retain all the natural juices.

The effect of heat on the starch of foods is to make it more digestible, while the fat is chemically practically unaffected by the degree of heat used in cooking.

When cooking with electricity, very little water is necessary or should be used. This is most important since it takes much energy to heat up the unnecessary water and vegetables do not boil away. When properly handled the solid matter boiled away is practically nothing. In fact the saving in weight due to less shrinkage might easily pay for the higher cost of heat especially under the present condition of high prices.

Due to the ability of a properly insulated oven to conserve the heat for a long time, the energy can be shut off, long before the process is completed and the food allowed to bake or cook until done, on the same principle as the fireless cooker, yet with a large saving in energy cost.

In other words the heat of electric energy lends itself readily to cooking and baking since it eliminates the many variables attendant upon the use of combustion devices. Hence its practical application in this field should have a rapid growth.

SAN DIEGO COMPANY TO PURCHASE DEL MAR ELECTRIC UTILITIES.

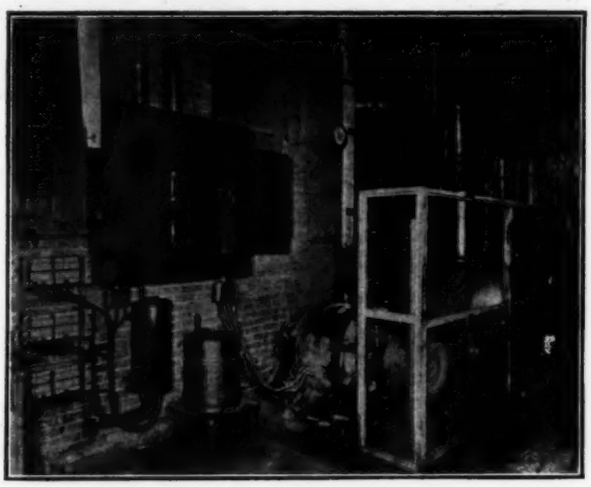
The San Diego (Cal.) Consolidated Gas & Electric Company is seeking authority from the Railroad Commission to purchase from the Del Mar Light & Power Company all of the Del Mar Company's electric distributing system serving the community of Del Mar. The system is now supplied under contract by the San Diego Company.

In a few weeks the company's transmission system to connect with the Southern California Edison System at San Juan Capistrano will be completed, at which time the Company will begin purchasing energy generated by water power from the Edison Company under a long term contract.

ELECTRIC DRIVE SAVES 30 PER CENT.

Central-Station Service Replaces Steam Engine in Foundry of Taylor & Company.

A saving of 30 per cent in power cost is the report from Taylor & Company after replacing a steam engine in their foundry in Greenpoint, Brooklyn, N. Y., by 150 horsepower in Westinghouse motors. The motor shown in the illustration is a 50-horsepower machine and drives a 12-inch by 12-inch Curtis air compressor. This motor is of the wound-rotor type,



Motor Drive and Central-Station Service Reduced Power Costs 30 Per Cent in This Foundry.

desirable for compressor service because its speed is adjustable. At the left of the compressor motor is seen its controller, that for another motor; and above, Krantz safety-type switches for each motor. These are so arranged that it is impossible to touch any part of the circuit while it is alive. The fuse-compartment cannot be unlocked until the switch is open.

In addition to the saving in power cost, the management finds the power supply of central-station lines to be more steady and satisfactory than that of their own power plant. This leaves all their energies free for the main job—turning out sound castings on schedule time and at a minimum cost.

Power for this installation is furnished by the Edison Electric Illuminating Company of Brooklyn.

BROOKLYN COMPANY SELLS 559 TOASTERS IN 30-DAY CAMPAIGN.

The Edison Electric Illuminating Company, of Brooklyn, N. Y., made a flying start for 1918 in the matter of its monthly special sales. T. I. Jones, general sales agent, instituted during January a toaster campaign, selling the device to its customers at the attractive price of $3.95. At the close of business on January 31, the company had taken a total of 559 orders, as against 230 during the last campaign. In view of the advanced prices and existing business conditions, the results are considered very gratifying.

Two Show Windows of Merchants Heat & Light Company Devoted to Sale of Valentines for French Relief Fund.

PATRIOTIC ACTIVITIES OF MERCHANTS HEAT & LIGHT COMPANY.

Indianapolis Central Station Devotes Show Windows to Patriotic Displays and Aids in Raising Funds.

No finer example of practical patriotism, made effective through a going organization of men and brains and heart and spirit, could be found than that shown in the work performed by the Merchants Heat & Light Company, of Indianapolis, Ind. And it was quite to be expected that it would be undertaken, for the city has not been indifferent to the practical beneficence of the service it has rendered the people in a purely business way.

The war found the company pretty firmly established in the good will of the people—for it is not difficult for a public service corporation to be popular. And since the war it has grown tremendously in the public esteem. There has not been a day—scarcely an hour of the day—when the machinery of the splendid organization that has been built up by H. H. Harrison and his associates has not been carrying on war propaganda or doing more substantial things. It has proclaimed, literally from the housetops, the duty of the citizen; it has led in performing its duties. And it has done much to reconcile the people to the fact that an effective corporate body is not soulless, as is commonly thought.

The company is at present co-operating in the food-conservation movement by appropriate window displays and newspaper advertising, and is also conducting a sale of comic valentines, the proceeds from which will be devoted to the French relief fund.

The accompanying illustrations show four recent window displays, two devoted to food conservation and two to the sale of valentines.

Last fall the company conducted a campaign to obtain Christmas gifts for French children, which resulted in sending 18,000 presents abroad.

If every one in Indianapolis would save each day
7 OZ of MEAT
2 OZ of FATS
1 SLICE of BREAD SAVED
1 Teaspoon of SUGAR
1 CUP of FLOUR
1 OZ of BUTTER
OURS AND OUR ALLIES
ARMY MESS KITS
ARE YOU DOING IT?

Two Show Windows of Merchants Heat & Light Company Devoted to Food Conservation.

Contracting-Construction

Usefnl Suggestions on Bending Conduit—Code of Practice Submitted for Electrical Contractors—Among Contractors

METHODS OF BENDING CONDUIT.

Sixth of a Series of Articles Describing the Best Practice.

By Terrell Croft.

In Forming a Number of Duplicate Bends With a Roll Bender the scheme suggested in Fig. 33 is used. Often where a number of conduits constitute a multiple run they should be bent exactly to the same radius. An example of this condition is illustrated in Fig. 34, where the bends *B* should all be of uniform contour. To insure this uniformity, a chalk or center-punch mark is made on the conduit at the point where the bend should start. Then when the conduit is placed in the bending machine, this mark is located opposite

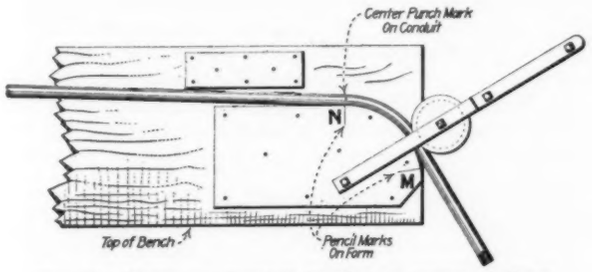


Fig. 33.—Marks on Conduit Bender to Insure Uniform Duplicate Bends.

a pencil line (*N* in Fig. 33) on the form. Another pencil line *M* is marked on the form at the point to which the bend should extend. In operating the bender, the operator pulls the roll only just far enough so that the conduit will lie tangent to the mark *M*. The bend is then completed, the conduit can be removed from the form and the next one inserted.

To Make Uniform Bends with a Bending Rack which is fastened to the top of a bench, a nail (*S* in Fig. 35) is driven into the bench against which the

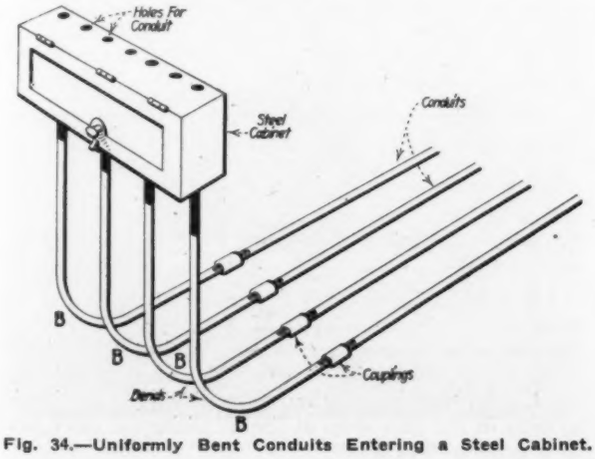


Fig. 34.—Uniformly Bent Conduits Entering a Steel Cabinet.

end of the conduit is butted. Assuming that the length of the short leg of the bent conduit should be 26 inches from the side of the long leg, the nail or spike is driven into the bending bench 26 inches from the end point of the curve, as shown in the illustration. Each of the conduits to be bent is inserted in the groove between the blocks B_1 and B_2, its end being against the nail, and the wireman pulls the far end of the tube around the form, thus forcing it to the required contour.

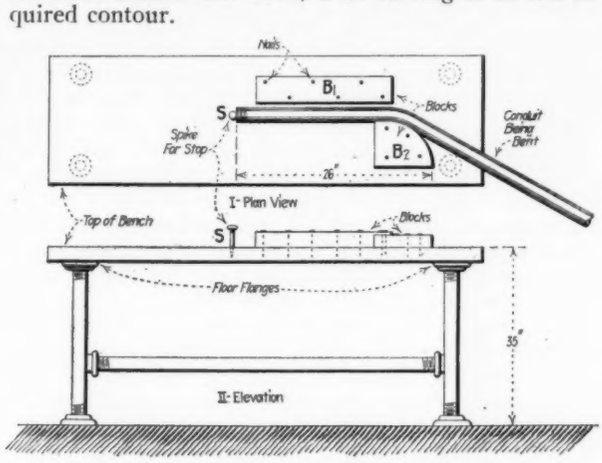


Fig. 35.—Form for Bending Conduits to Exact Contour Arranged on Bench Top.

A Device for Quickly Forming Bends at the Required Location in the Conduit may be readily constructed (as shown in Fig. 36) by attaching a couple of scales at the side of the bending form. The arrangement may be assembled on the top of the bench. The block *B* may be a piece of 2 by 4 having one end rounded off to the curvature required. It is fastened to the bench top with screws or nails. The scales *P* and *T* may be pieces of 2 by 2 dressed timber. *T* is removable and extends only to the point *X*. It is thus arranged so that it can be taken off of the top of the

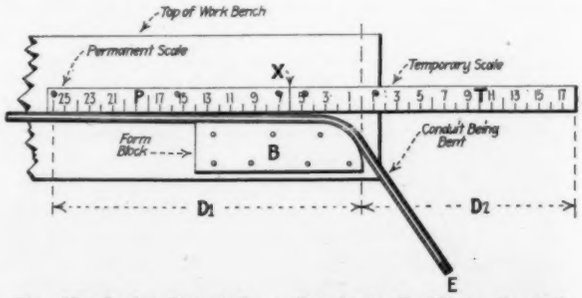


Fig. 36.—Scales Mounted on Bench to Facilitate Conduit Bending.

bench for transportation by taking out two wood screws. If left permanently attached to the bench top it is liable to be broken. In bending, the conduit is

laid in the groove with its end *E* extending out along *T* to some point which has been determined by experiment. Then without shifting the conduit longitudially in the groove, the end *E* is swung around until the elbow in it has been formed. The scale *P* may also be of service in locating the bends at the proper positions in the tube. Both *T* and *P* may be graduated in inches or other suitable units.

(To be continued.)

STANDARD CODE OF PRACTICE FOR ELECTRICAL CONTRACTORS.

Massachusetts State Association of Electrical Contractors and Dealers Submits Code for Approval.

The following code of practice has been recommended to architects, consulting engineers, contractors, owners and owners' engineers by the Massachusetts State Association of Electrical Contractors and Dealers as a step toward the standardization of many practices in connection with original contracts and charges for extras, which, unless definitely settled in advance, give rise to misunderstandings on both sides and frequently to controversies and litigation. The Massachusetts State Association of Electrical Contractors and Dealers does not attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors. It is to be hoped that other associations of electrical contractors will take under advisement the adoption of this sensible and equitable business code.

I. Contractors will submit bids for electrical work upon condition that a full set of plans, specifications and general conditions be placed at their disposal for a reasonable time, free of cost, for use in their office for the purpose of preparing an estimate.

II. The standard form of contract of the American Institute of Architects is to be the basis used for all bids, unless otherwise mutually agreed upon.

III. The contractor shall be paid monthly in cash at least 85 per cent of the value of the materials delivered and the labor performed.

IV. Each contract shall provide for the prompt payment and require final inspection and payment in full within 30 days of the completion of the work covered by said contract, regardless of the final settlement for the building as a whole or for the work of any other trade.

V. Differences arising between the contractor and other parties on a contract are to be subject to, and settled by, arbitration.

VI. The contractor shall not be responsible for loss due to any delay in the execution of the contract when such delay is in no way the fault of said contractor. The time lost by reason of strikes, lockouts, fire, washouts, delays by transportation companies, or any other cause, over which the contractor has no control, will be added to the time of completion of the work covered by the contract.

VII. The contractor does not estimate on or include any charges for surety bonds, insurance not required by law, or any general charges for cleaning, removal of rubbish, patching or repairing of plaster, brick or terra cotta work, breaking of glass, office or telephone service, water, light, heat, fire insurance, use of general gangway, scaffold, use of hoisting facilities, stenographer, watchman, erection of temporary structures, enclosures or stairs, or any other similar charge, unless mutually agreed upon in advance.

VIII. The contractor shall not be required to cut any work, except his own, and shall not be required to cut, alter or move his own work if due to any cause for which he is not responsible.

IX. Unless specifically provided for in the contract, an extra charge will be made for any special finish or variation from the standard materials. By "standard materials" is meant standard material as regularly listed by the manufacturer whose product is specified.

X. Changes in or additions to contract plans or specifications shall be made the subject of estimate or shall be based on the time and materials involved.

XI. If the regular and normal progress of the work is held up due to extras or changes or other causes over which the contractor has no control, an interference or interruption charge shall be made, depending on the extent of the interference or interruption.

XII. A fair price will be charged for drafting or engineering services when the contractor is called upon to render such services.

XIII. The contractor shall not include temporary work in his estimate unless the quantities are distinctly stated. In no case should be included in an estimate maintenance or cost of current except on a percentage basis.

XIV. "Cost" shall be understood to mean cost of material and labor and the administrative or overhead expense of the contractor.

AMONG THE CONTRACTORS.

The Home Electric Company, of Louisville, Ky., has received the contract for the electrical work in a new $200,000 storage building at Jeffersonville, Ind.

The wiring contract for the new Central School at Fort Scott, Kans., has been let to the Southwestern Electric Company, of Wichita, Kans. The building will cost about $120,000.

Hatfield Electric Company, 102 South Meridian Street, Indianapolis, Ind., has under way the wiring contract for a two-story apartment building in Indianapolis.

Charles Pfizer & Company, 11 Bartlett street, Brooklyn, N. Y., have awarded a contract to Peter Guthy, 926 Broadway, Brooklyn, for the proposed alterations and improvements in their power house to cost about $15,000.

M. E. Hooks & Company, contractors and dealers, of Utica, N. Y., have removed from 515 Charlotte Street to new and more commodious quarters on Devereaux Street. A new store has been fitted up and gives better facilities in every way for the rapidly growing business of the firm.

The Sterling Electric Company, of Minneapolis, Minn., has secured a $50,000 contract for the electrical work, including lights, telephones and bell systems, in the Technical and Junior High School at Virginia, Minn. The building when completed will cost $1,000,000. Carl E. Nystrom, Duluth, Minn., is the architect.

The United States Government, through the Bureau of Yards and Docks of the Navy Department, has awarded a contract to the White City Electric Company, 724 Ninth street, N. W., Washington, D. C., for the installation of a new electric lighting system in the gun shop at the Washington navy yard, at a price of $12,900.

Contractor-Dealer

Electrical Dealers Asked to Co-operate With Government —Model Repair Shop in New Orleans—Use of Electric Fans

ELECTRICAL DEALERS ASKED TO USE PATRIOTIC WINDOW DISPLAYS.

During the war electrical merchants can perform a helpful and patriotic service by devoting all or a part of their window space to an occasional display aiding the efforts of the Government in its various activities.

Posters put out by the U. S. Food Administration explain the food situation and the aims of the Food Administration concisely and attractively. These posters will be sent on application to the U. S. Food Administration, Washington, D. C., in case your local food administrator cannot supply you.

The food situation is a vital consideration—of much greater importance than the average person realizes. Every one should be made cognizant of the true facts in the case.

Half the world depends on the United States for its food. Millions of men in England, Scotland, Ireland, France, Italy and Belgium have been taken from peaceful pursuits for making war munitions. They are gone from the farms. Even before the war these countries raised less than they ate. Their need is now greater than ever; their production is less than its want; they are cut off from half the world by the shortage of shipping.

Therefore, our associates in this war depend on North America for food as never before, and they ask us for it with a right that they have never had before. The U. S. Food Administration asks every man, woman and child in America to get behind our soldiers, sailors and our Allies by eating less wheat, beef, pork, fats and sugar—and by avoiding waste.

Food will win the war. Will you help with your windows to influence others, as you are undoubtedly already helping in your homes?

A MODEL ELECTRIC REPAIR SHOP IN NEW ORLEANS.

Stewart Electric Company Operates Prosperous Department in Conjunction With Contracting and Retailing.

The unprecedented high costs of new electrical machinery, coupled with the delays inherent in securing delivery, have resulted in a harvest for the well equipped electrical repair shop having facilities for repairing, hewinding and rebuilding, motors, generators, etc. In fact, the situation during the past few months has strongly emphasized the need for such establishments and has directed the thoughts of many contractors and dealers to the opportunities offered by such a department as an adjunct to their business.

Maintenance work, under contract, is a phase of activity that can be secured to improve the load-factor of the repair shop and it is comparatively easy for the electrical contractor who has just completed a new installation to arrange for the additional service of keeping the equipment in good operating condition. This is especially true in the smaller plants where such maintenance service would be much less expensive than employing an electrician to do the work.

The Stewart Electric Company, of New Orleans, La., is a typical example of how a repair department can be made an important adjunct of a contracting and retailing business. This progressive firm has steadily developed this phase of its work and today it operates a complete shop, equal to that of many manufacturers, which is equipped to handle any class of work from the repair of a fan or household device to the rebuilding of a motor or generator of any size.

The company occupies a four-story building convenient to the retail shopping district of the city. The first floor is taken up by the retail store and offices.

Hand Crane for Handling Machines.

Corner of Store Showing Rebuilt Machines.

View of Miscellaneous Repair Department.

Armature Winding and Repair Department.

Two of the accompanying illustrations show sections of this store, space being provided for the displaying of a wide variety of motors and generators, as well as for the usual show cases and counters for general merchandise. The upper floors are occupied by the stockroom and shop.

As will be seen from the illustrations, the shop equipment comprises a wide variety of tools and machinery, complete in every detail. Any class of electrical repair work can be undertaken and, in fact, new machines could be completely built in the shop with the exception of the castings. Several ingenious coil-winding machines are in use, which are the invention of Mr. Stewart, who gives his personal attention to the management of the shop. All machines are motor driven.

Accurate costs are kept in each department by a comprehensive job-ticket system which Mr. Stewart has devised. The cost of labor or time on any job at any stage of its progress can be immediately ascertained by means of this system. Repair work is also done on the customer's premises when desired and the same cost system is applicable to such work also.

The continual increase in the company's business has taxed its facilities and plans have been completed for remodeling the adjacent building and thus almost doubling the present floor space.

Corner of Machine Shop Where Motors Are Assembled and Frames Rebored.

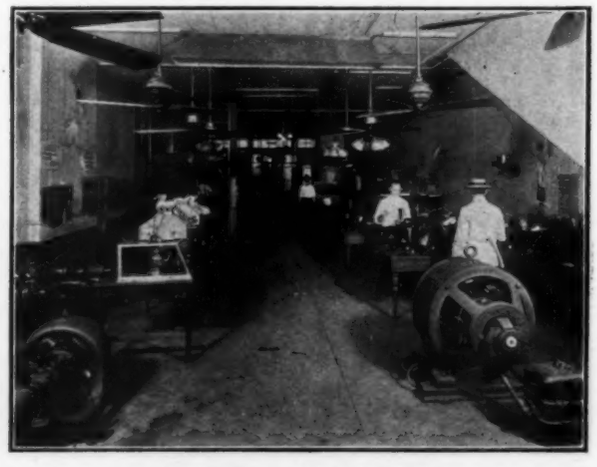
ELECTRICAL APPLIANCES CONSERVE COAL.

In one Ohio city, during the first pinch of the coal shortage, a committee of citizens asked merchants to take all electrical appliances off their shelves and owners of such appliances to stop using them. This was supposed to be a means of conserving the supply of coal on hand.

This committee meant well—but they were in error. Electrical household appliances are conservers of coal. They eliminate waste of heat because they cease consuming it the instant the current is switched off.

Take the electric iron, for instance. It heats up almost instantly, when the connection is made. The instant the circuit is broken the use of coal for that appliance ceases. Compare this limited use of coal with the heating of an old-fashioned sad iron. For nearly half an hour before the kitchen stove is hot enough to heat the iron, it must consume coal. While the iron is in use coal must be constantly piled into the stove to keep it hot enough. In other words, coal must be used to keep both the stove and the iron hot. Electricity has nothing to heat but the iron itself.

Other electrical appliances are equally saving of fuel for the same reason. They only use as much as will make the appliances themselves efficient.



General View of Retail Store.

Making the Electric Fan More Useful

Oldest Motor-Driven Portable Appliance Still Used Almost Entirely as a Summer Convenience—Suggestions for Increasing Its Efficiency as a Breeze Maker—Aiding Ventilation

THE electric fan was the first portable electrical appliance to come into much use and is now the most extensively used portable motor-driven device. Over a quarter century of development work has been devoted to the fan motor and consequently it is now one of the most highly perfected electrical appliances. However, in view of its relatively long period of development and its general utility, it is rather surprising to find the electric fan used in a far too restricted way.

The object of this article will be to point out some of the ways in which its uses can be increased and how the common electric fan can be employed to promote conservation and efficiency—two potent watchwords of the times. An effort will also be made to show how the manufacturers and dealers of electric fans and the central stations supplying them with energy can co-operate in educating the users of fans to avail themselves of their as yet little appreciated utility.

Cooling Action of the Fan Oldest and Most Commonly Used.

In its elements an electric fan of the ordinary portable type is an extremely simple contrivance, consisting merely of a set of blades on the end of a motor armature or rotor. As soon as electric motors were made in small enough sizes to be fairly portable, it was not surprising that this simple combination was hit upon as a very convenient and economical means of producing an artificial breeze. On an oppressively hot summer day a breeze is always welcome, so the electric breeze producer found immediate application as a convenient cooling device.

Refinement of the fan followed gradually by the development of more efficiently shaped and quiet-running blades; less clumsy and heavy, more compact and efficient motors; guards to prevent curtains or other objects from being caught in the whirling blades; rheostatic or other means for regulating the speed; and hinge, swivel, trunnion or similar means for adjusting the direction to which the breeze is blown and even to permit turning the base of the device through 90 degrees so it might be mounted on the wall or the side of a column. Mechanism for oscillating the fan was developed at a later period when it was realized that a too concentrated breeze blowing steadily in one direction is under certain conditions not desirable.

Business offices were the principal places where electric fans first came into use; in fact, the ordinary fan was called a desk fan because of its common use on office desks. The fact that it could be just as useful on a table, bookcase or piano at home was not realized in those days, partly because the early fans were both too cumbersome and heavy to be moved about easily. In the office, however, the close relation between comfort and efficiency was recognized and the use of electric fans on hot, sultry days enabled office managers to secure as much and as accurate work from employees as on days when working conditions were ideal without artificial aid.

When the ceiling fan was brought out it found ready application in restaurants and hotels where a cool dining room was found to invite patrons and make them tarry, whereas under former stuffy conditions they either would not enter on a very hot day or stay but the shortest possible time. In southern cities especially the patronage-drawing power of both ceiling and desk fans was quickly recognized by the more enterprising hotel managements, who found that rooms equipped with them were always in demand during the trying nights of the long southern summer season. Now practically every southern hotel is so equipped.

Without tracing the detailed development of the electric fan as a breeze producer, it is evident that in the public mind its cooling action is overwhelmingly its predominating characteristic and utility. The electric fan seems to be inseparably associated with hot summer weather and it should be so, but unfortunately it has not been associated to any great extent with anything else in particular. Nor, in fact, has its cooling action been properly understood in many places, as is evident from the numerous inefficient attempts one sees at using it for cooling. Before referring to other uses of the fan, such as for drying, ventilating or heating—heating by an electric fan seems at first thought an impossibility—let us consider the more effective use of it for cooling.

How Cooling Is Effected by an Electric Fan.

Cooling the body by the breeze from a fan is accomplished in two ways: By the impact of cooler air on the skin which directly lowers its temperature, and by the blowing of relatively dry air over the perspiration on the skin which causes the moisture to be evaporated and thereby extracts from the skin the heat necessary to effect this evaporation. During very hot weather this second action is by far the more important because it can be effected by air that is no cooler than that present in the room. The cooling effect of evaporation can be very easily demonstrated by pouring a little alcohol or, better yet, ether into the palm of the hand. These liquids evaporate very readily, and, since heat is required to change a liquid to vapor or gas, the requisite heat is extracted from the skin. By fanning the skin it will be found that the evaporation of the liquids is accelerated.

The same action takes place when fanning the perspiring skin. The normal temperature of the blood is 98.6 degrees Fahrenheit and an excess of its temperature of but a few degrees quickly produces what is called a fever. Nature's method of combatting increasing temperature over this safe normal value is by means of profuse perspiration. This is why a breeze is so welcome in summer, even though the breeze is not itself a cool one.

If the breeze is too hot it may heat the skin directly more than it cools it by promoting evaporation, or if the breeze is of suitable temperature but too humid it may check instead of aiding evaporation; in either case no cooling will be effected and the oppressive

sensation may be enhanced; fortunately, these cases are quite rare. If the breeze is too cool in temperature, or too strong so that evaporation is excessive, just as is the case with the ether experiment, the cooling action will be too rapid and the uncomfortable sensation of chilliness is likely to be produced; unfortunately, these cases are not uncommon.

To Make Cooling by Fans More Efficient.

From the foregoing it is evident that effective cooling by an electric fan may be accomplished by proper regulation of the volume of its breeze so that it falls within the comfort range of being neither too strong nor too weak. It is only on extremely hot days that a full-speed, direct and steady blow from a medium or large-sized fan is comfortable to the average person. This accounts for the use of electric fans being so restricted to the very sultry days, since in too many cases no effort is made to regulate the breeze.

The fact is, however, that even on moderately warm days the efficiency of an office organization falls off considerably, especially if the humidity is high. In these days when women and girls constitute an ever-increasing percentage of office help, greater attention to comfort is imperative, both because efficient service by employees requires it and because employees will quit where comfort is not given due consideration. It is so easy and inexpensive to provide relief from all degrees of summer heat and humidity that it is surprising to find fans in use on only the very hottest days in many establishments. On a mildly warm day the fans need not run at full speed, the breeze being regulated to suit requirements. Better yet, by the use of oscillating fans the zone of influence of a single fan is increased and the objection of too chilly a breeze from a fixed fan is overcome.

Another matter often overlooked is the direction of the breeze. When there is a natural breeze it would be foolish and wasteful not to avail oneself thereof. The electric fan is not a competitor of natural breeze, but a substitute for it when lacking, and an aid to it when deficient. If this view is correct, and it seems a logical one, the fan should be so placed or turned as to aid what natural breeze there is instead of opposing and neutralizing it. The writer has seen countless fans vigorously blowing against a gentle breeze that was trying to enter the windows or doors. The fan should be placed so as to help this breeze, unless the latter is exceptionally hot and sultry. In such cases it is better to close the doors and windows entirely and turn on oscillating or fixed fans so as to keep the interior air in motion; much more comfort will result than by trying to neutralize all breeze.

The few instances cited merely make clear that in spite of the quarter century of use of electric fans for cooling purposes, there is a woeful lack of intelligent use in this oldest and best known application of the fan. Evidently there is room for much educational effort. Intelligent use brings better satisfaction and this in turn leads to much wider use.

Electric Fans as Aids to Ventilation.

Cooling by a fan is a fairly simple process compared to ventilation in general. Ventilation is a subject much less understood. The word itself is used in a variety of ways and unfortunately is often made to cover a multitude of evils. It will be used here in the broad sense of improving the quality of the air in a room or other inclosure to make it suitable for wholesome and comfortable living. Public health authorities are by no means agreed as to exactly what are the criteria of wholesome air, but in general, it may be stated that it should be substantially free from poisonous gases, bad odors, smoke and dust; it should be within a certain range of temperature and humidity; it should be in motion. On these points there is considerable agreement.

Regarding the best means for securing ventilation there is much less agreement. Some contend that the air must be bodily removed from the room a certain number of times per hour and replaced by fresh outside air; others believe this is entirely unnecessary and absolutely wasteful of heat; still others hold an intermediate opinion and advocate replacing the air to a limited extent and also thoroughly agitating and keeping it in motion. The first parties base their contention on the known healthfulness of fresh outside air and the banefulness of stagnant, foul, "canned" air. The second parties admit stagnant air to be injurious but point to the now classic investigations of Dr. Leonard Hill in England and of others, who found that on placing men in a sealed inclosure like a large glass cage they quickly showed lassitude and became uncomfortable while the air remained still, but felt quite normal and bright as long as the air was kept in motion by means of electric fans, it being believed that the perspiration thus relieved was the chief source of the discomfort experienced in a close atmosphere. The third parties accept the statements of both the others to a certain degree and favor a combination of their proposed remedies.

There is much to be said for this intermediate course, especially in times like the present when "heatless" days emphasize the importance of conserving fuel wherever possible. There is no question about the improvement in the quality of the air by being agitated and set in motion. However, renewal of the air is also necessary, at certain intervals at least, else its condition will gradually deteriorate and we shall again have contaminated air. During the coldest weather, strong winds may cause sufficient leakage around windows and doors to provide the air renewal needed within, but the air in the room must not be allowed to become stale in the breathing zone through the absence of effective circulation. To a certain extent this circulation will be promoted by the convection currents of steam or other radiators, or the direct circulation of hot-air heating systems. But in a great majority of cases such circulation is too limited and in some portion of the room the air will be almost entirely stationary, especially in large rooms.

A number of public health authorities have advocated that the air quality be improved in school rooms, theaters and assembly halls in particular, by the liberal use of oscillating electric fans. These will not only make the conditions much more comfortable, as Dr. Hill found in the tests referred to above, but they will also make more equable the temperature throughout the room, which now is found to vary by quite a number of degrees, and thus materially aid the heating. This use of oscillating fans need by no means be confined to the places mentioned, but may also be applied in residences, offices, etc. It calls for a quiet-running oscillating fan whose speed can be adjusted to suit the requirements. In quite a few motion-picture theaters oscillators are used in this way on pillars or brackets along the side walls. They are so directed that their prevailing breeze is in the same general direction as the main ventilating air current carried from the inlet to the exhaust fans.

Other still rather unfamiliar uses for electric fans will be commented on in another section of this article, to appear in an early issue.

PROTECT YOUR PROFITS AGAINST A FUTURE DECLINE IN PRICES.

By H. H. Gould.

"How have the war and the advancing prices of merchandise affected the retail business?" the investigator asked of a certain live electrical dealer, with whom he was discussing modern merchandising problems.

"That is a question which I have asked myself a good many times during the last year," he replied, "but never was quite able to answer it satisfactorily until a couple of weeks ago, when I made a complete analysis of my books and inventory of my stock. And then I got my eyes opened to two things that I should have known long ago.

"And right here, let me say that I would advise every merchant to study his books and his stocks right now more carefully and analytically than he has ever done before. The trouble with most of us is that running a retail business has been too easy a job in the past and as a consequence we have gotten the habit of being careless. We haven't felt the necessity of watching our business carefully as we have been getting along satisfactorily without.

"But the constantly advancing prices have made a difference. Not that we haven't been able to make profits. On the other hand, it has never been so easy for the dealer to put up his prices to where he can make a satisfactory margin. The public has come to expect a raise about every so often.

"But what has been bothing me was where my profits had gone to. I was selling lots of merchandise. Last year was by far my largest year. And I had gotten a more satisfactory margin in general than usual. But when I wanted to put my hands on my profits to buy a new Franklin, I couldn't find them. They weren't there. That was what led to my analyzing my business and taking a complete inventory.

"And here is what I found. In the first place, I had been making profits allright, but they had been absorbed in the higher prices I had had to pay to replenish my stock.

"My inventory showed, for example, that my present stock is worth $15,000, while my stock of practically the same size a year ago was valued at only $10,000. Five thousand dollars of my profits had thus gone to replenish my stock.

"The second thing I found was that the largest part of my total volume had been done on the good grades of quick-moving, standard merchandise, and that the biggest part of my stock left over at the end of the season was of the inferior, non-standard grades. People have more money to spend and are buying better grades of merchandise than formerly."

Undoubtedly, this man's experience is more or less typical of that of practically every other dealer. Electric dealers generally are finding that it requires greater capital to maintain their stocks than formerly and they have been obliged to reinvest their profits right along in order to get this necessary capital.

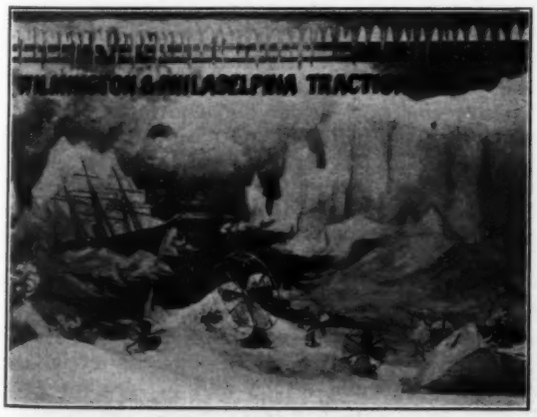
The problem, then, which retail merchants must face is how to protect themselves against the time when prices reach their highest peak and start downward again.

This dealer's experience suggests the answer. Make sure that your money is invested in quick-moving, standard brands which will enable you to get your money out of them quickly while you can still make a profit from them, rather than having it tied up in inferior grades of non-standard merchandise which may remain on the shelves for several months, making it necessary for you to sell at a loss.

Louisville Dealer Conducting Electric Appliance Campaign.

The Childers Electric Company, Louisville, Ky., recently sent out folders featuring a new table stove, electrically operated, which has recently been marketed by the Rutenberg Electric Company, of Marion, Ind., and which sells at $8.50 for the 660-watt, 110 or 220-volt size; or $9 for the 32-volt size. This device can be used for broiling, baking, toasting, and is the latest of a number of portable electric devices gotten out by the company. The Childers Company has also been featuring the "Majestic" electric heaters, which retail at $9, and for which there has been a very good demand this winter on account of the shortage of coal and gas. Leading electrical device handling concerns have done an excellent business on all kinds of household devices used for heating, cooking, etc., this season.

Suggestions for Fan Window Displays



With temperatures of from 90 to 100 degrees everyone's thoughts turn to electric fans and central stations and dealers are concerned only with maintaining their stocks so as to supply the demand. Such temperature, however, is unusual, and during the periods of normal summer weather it is necessary to continually call attention to the comforts resulting from use of fans. Window displays are one of the most effective methods available and many ingenious ideas have been devised to portray the cooling effects of the fan breeze. The two window displays shown above won prizes in a recent contest. In one fans are directing a campaign against Fort Summer Heat and in the other the North Pole is pictured.

Motion-Picture Advertising for Electrical Dealers

Suggestions for Attracting Attention to Your Store and Show Windows by Inexpensive Methods, Open to All

By ERNEST A. DENCH

WHILE the impersonation of film favorites may be a far cry to the electrical dealer and contractor, there is no reason why the popular fashion should not be capitalized on, especially when it means more dollars to the electrical dealer's bank account.

Persuade some young man or woman, for a money consideration, to impersonate some player with distinct personality—a personality that can be easily impersonated. A few players are Charlie Chaplin, (his walk); Lillian Walker, (her dimples); Douglas Fairbanks, (his grin); Mary Pickford, (her curls); Theda Bara, (her fascinating eyes).

Then, to boost, say, your cooking appliances department, make an announcement in your newspaper advertising, and your store window, to the effect that each person making a purchase in this department on a certain day will be attended to by the local "Lillian Walker," who will present each customer with a complimentary ticket entitling her to see Lillian Walker the next time she comes to the local movie. These tickets will cost you but a few cents apiece, for the exhibitor will give you a rebate on a quantity basis.

Whose Eyes Are These?

The eyes possess an individuality essentially their own. It is no exaggeration to say that the easiest way to recognize a person is by his eyes.

Once in a while one of the motion-picture magazines cuts out the eyes of some popular star's photographs, publishes them and asks readers to tell whose eyes they are. It is easy to tell at a glance whose are Mary Pickford's, Douglas Fairbanks', Earl Williams,' Lillian Walker's, but there are some players who have attained a fair degree of popularity whose eyes require the deduction of an amateur detective to recognize them.

Praise be to the electrical dealer and contractor who can add an element of mystery to his newspaper advertising and window displays. He need not go further than the motion-picture field for the right dope. For an "Whose Eyes Are These?" contest, purchase some movie star's photographs from the nearest stationary store, though if you can buy some large ones from the nearest photoplay exhibitor they are to be preferred because they are generally more up to date and the thing you want to avoid is a well-known photograph. Cut each photograph around the eyes, have cuts made of the eye portions and run one or more at the head of each newspaper announcement.

Announce your contest as follows:

"WHOSE EYES ARE THESE?" YES! WE REPEAT "WHOSE EYES ARE THESE?"

"They are owned by a player whom you see often on the screen of the 'Idle Hour Theater.'"

"There are several more eyes to follow, so if you can guess the most of them correctly, you will be given any article in this store worth up to two dollars."

The theater will probably return the little boost you have given it by loaning you other photographs. Pin each photograph to a board at the back of your window, and place a card in the middle, as follows:

"IT IS NOT NECESSARY TO ASK WHOSE EYES THESE ARE. THE PHOTOGRAPHS SPEAK FOR THEMSELVES.

ALL THE HELP WE CAN OFFER YOU IS BY SAYING THAT THE EYES WILL BE CUT FROM SIX OF THESE PLAYERS' PHOTOGRAPHS."

The window display, of course, should precede the "WHOSE EYES ARE THESE?" newspaper announcements in order to do any good, for the more mysterious you can make a contest of this kind, the better it will be.

An "How Many People Outside Your Store" Movie.

You can do all sorts of unusual things with a motion-picture camera. Perhaps the most common one is that of turning the handle of the motion-picture machine slower than it should be turned. Instead of making the people in the scene move slower, it actually makes them mover several times faster. This stunt always commands a laugh, even though when it is pulled off in such a serious educational as climbing one of Japan's sacred mountains.

At a busy hour of the day announce in your advertising and window display, that a motion-picture operator will film those who are passing your electrical store. After this the film will be shown at the local theater and the one who can count the exact number of persons fleeting through the scene, will be presented with a month's complimentary ticket. It will be heaps of fun for folks to see themselves moving at a ridiculously fast pace and will have your store talked about for quite some time after the stunt is over.

One phase of house-organ distribution to which the average electrical dealer and contractor does not pay much attention is the distribution end. He is well content to accept the theater's mailing list and the theater's personal circulation as the local outlets, but is evidently oblivious to the fact that many of his customers are not on the theater's mailing list, nor do they attend the neighborhood theater. Instead, they go down town every time when in quest of amusement. The electrical dealer and contractor may argue that this is no concern of his, but that ten cents car fare comes out of his pocket. The money is taken away from the neighborhood and besides the down town habit may spread to other things, the buying of electrical appliances—for instance.

Therefore, the electrical dealer and contractor is doing no unselfish thing when he incloses a theater program in every package that leaves the store.

Electric Vehicles

Data on the Advantages and Economies of Electric Passenger and Commercial Vehicles and Industrial Tractors

ELECTRICS SOLVE MUNICIPAL HAULAGE PROBLEM.

Maximum Efficiency at Minimum Cost Obtained in Fire, Police and General Service.

The average citizen has an extremely limited idea of the extent to which haulage or cartage is necessary in the every-day work of a modern municipality, or of the important part the cost of such haulage must of necessity play in the financial bulget of the city.

Even the average municipal official does not give this subject anything like the attention it really requires because of the fact that the cost of haulage is largely obscured and does not stand out as a separate item, since much of the work involving cartage is contracted for or is looked upon as incidental to the general work of a given department.

A municipality that is not giving serious study to the most efficient and economical methods of haulage as a separate and distinct item of cost is overlooking a very direct and definite means to considerable economies.

If by reason of not separating haulage costs from the general costs of any given department a city is using inefficient methods of haulage or is permitting such methods to be used in connection with work under contract, that city is very probably laying a burden of cost on its taxpayers which is unnecessary and unjustifiable.

Vehicles operated by electric motors with current from storage batteries have most clearly and conclusively proved their relative economy of operations in service over paved streets, where relatively short hauls and frequent stops are the rule. In other words, for nearly every kind of service within cities the electric vehicle has demonstrated an efficiency greatly superior to any other method of haulage under city conditions.

The mere fact that hundreds of fleets of electric vehicles are giving superior results in the service of large private corporations, such as express companies, breweries, coal companies, department stores and similar large users of city cartage is sufficient to indicate that the electric vehicle is equal if not superior to any other form of cartage in efficiency and cartage.

As a matter of fact, in many instances, the actual data of both private and municipal service show conclusively that the electric vehicle is decidedly superior to other methods of cartage, particularly from the standpoint of cost.

One very interesting sidelight on this point, projected by an experience broad enough to furnish conclusive data, is found in the operations of the company operating electric taxicabs in Detroit. This company has demonstrated that the cost of operating electric vehicles in this class of service is almost exactly one-half the cost of operating with vehicles driven by gasoline engines.

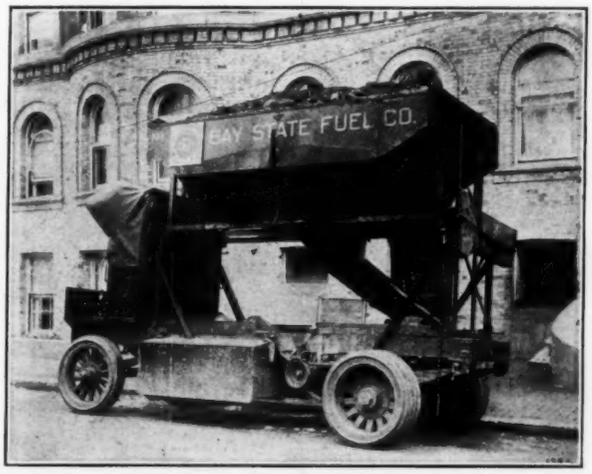
While this form of service is, of course, very different from truck operation, the figures are nevertheless illuminating as an indication of the general possibilities in the electric form of drive.

There would appear to be little doubt that the general application of electric vehicles for municipal haulage would increase efficiency and greatly reduce the cost of operation in many departments of municipal business.

ELECTRICS LOWER COST OF COAL DELIVERY.

Show Considerable Saving of Haulage with Gasoline or Horse-Drawn Vehicles.

In England during the early part of this year there were several weeks of extremely cold weather, which exhausted the fuel in nearly all of the coal cellars and caused a run on the merchants who supply poor customers with coal in small quantities. According to London advices, this coal shortage had not been anticipated, and while it was not, strictly speaking, a coal famine, there was such a scarcity of horses and men that there were not ample means of transporting the coal to the users, thus causing considerable discomfort and misery. Snow and frost produced a road surface which was as good as fatal to horses. Then began a most inglorious scramble for hundredweights and even pounds of coal. Perambulators, hand-carts, taxicabs and all sorts of things were pressed into service. It is easy to dismiss such a deplorable crisis with the remark that it was owing to the war. But it was not entirely owing to the war. The war merely showed up the weaknesses of a system which had come down from generations ago.



A Five-Ton Electric Coal Wagon Used in Boston, Mass.

"A leading London coal merchant states that three journeys formed the average day's work of a man with a coal cart. Four journeys could be done if the man hustled; but with the contrariness of the inde-

pendent workman, he was more inclined to do two instead of three or four, while every household was clamoring for deliveries.

"The maximum capacity of a coal cart is about two tons, so that the average performance of a horse and cart is six tons per day. The system of distribution is wasteful, because a horse and cart and a man have to be maintained for the transport of a few tons of material at a crawling pace for a mile or so.

"If, instead of depending upon horse traction, we had been provided with mechanically-propelled vehicles of much larger capacity, the coal famine would never have occurred. To anyone who argues that we should have been almost as badly off with petrol wagons, because of the restrictions on petrol, the lack of skilled drivers, and the difficulty of running heavy petrol wagons on ice-bound roads we would offer no denial.

"The conditions are, in fact, eminently suited to electric haulage. No power is used except when the vehicle is running; skilled drivers are not required, so that the carter can be driver as well; and the vehicle is ready for the road at any time under all conditions of surface. The limited radius of delivery—a feature which tells against the economical use of petrol or steam wagons—is favorable to the most economical use of battery vehicles.

Electric trucks have already been used in England for the transportation of coal from depots to electric power stations and to other large users. A three-ton electric coal truck used by a Glasgow firm works 307 days out of 865, and was out of commission only one afternoon and the following morning during one entire year, thus attaining a reliability coefficient of 99.65 per cent.

The value of the electric truck for coal delivery has been appreciated in this country for a number of years, and especially in New England, where there are many large fleets in operation. A novel electric coal truck is used by the Bay State Fuel Company of Boston. It is a five-ton truck with a body which can be hoisted on four heavy screw pins, and is adjustable to any height up to its limit of 39 inches, so that the coal can be conveyed by chute not only across the sidewalk, but across the average lawn. All operations, lifting or lowering, are controlled from the driver's seat, and the two-horsepower motor, located in the rear of the chassis for this purpose, is able to lift 5.5 tons of coal in 1.5 minute, using only 26 amperes of current. The body may be lowered in one minute.

Just at this time the fact that a great number of truck drivers will be drafted for services abroad, the possibility of many horses being commandeered, and the increasing scarcity of gasoline makes it advisable for the coal dealer to carefully consider his transportation facilities for the coming year. Since women drivers may have to be employed to a great extent, the electric truck seems to be the natural means of transportation to adopt.

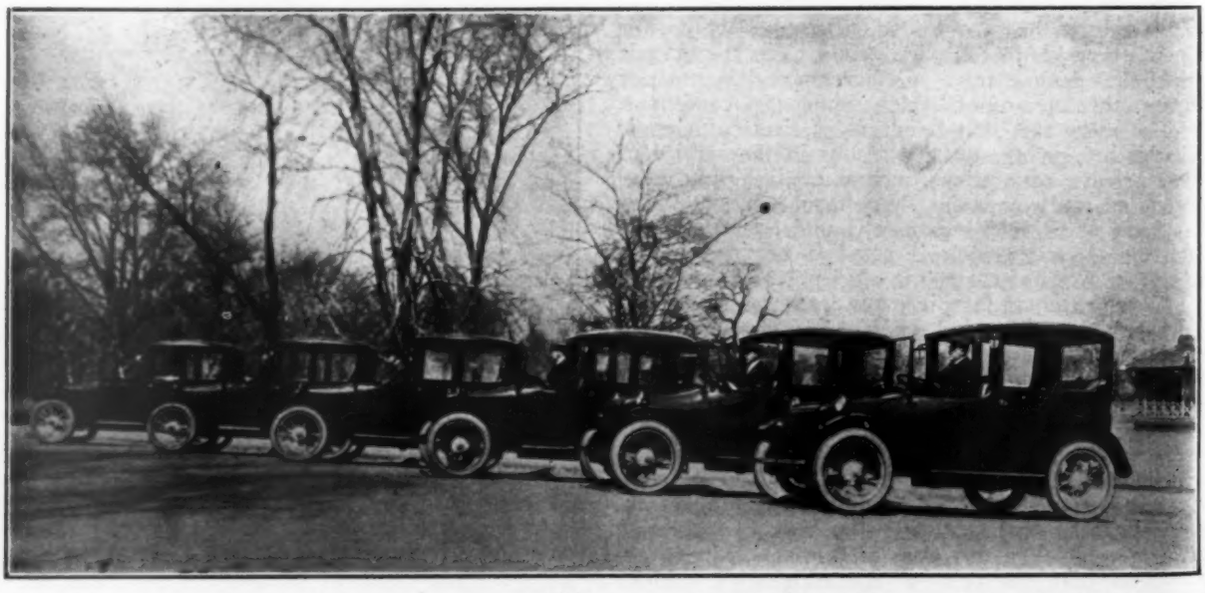
ELECTRIC VEHICLES EXTENSIVELY USED IN POSTAL SERVICE.

Electric trucks are being used very successfully by the Post Office Department in several large cities. St. Louis has had a fleet of electric trucks in its postal service for more than six years which have given splendid service even under the most severe weather conditions. These trucks are in service from 5:45 a. m. to 11:30 p. m. and average 30 miles each day.

The postal service in Boston uses 15 electric trucks which are operated on the "battery-service" plan. These "electrics" make runs of 25 miles each day, and have made substantial savings as well as greater efficiency in handling the mail.

The largest electric postal fleet in this country is probably that of the New York Postal Transfer Service which operate 47 "electrics." These trucks have been in service for three years, and are on duty for two ten-hour periods each day.

Electric Taxicabs Revolutionize Service in St. Louis



Electric taxicab service, which has proved so successful first in Detroit, Mich., and later in Chicago, has now been extended to St. Louis, Mo., the above illustration showing a portion of the fleet in use in that city. Lower operating costs, less difficulty with chauffeurs and much greater comfort and convenience to patrons are the features which characterize the electric taxicab and which have resulted in the rapid extension of the service in those communities where it has been inaugurated.

An Outline of Present Transportation Deficiencies

Existing Duplication, Waste and Delays Susceptable to Vast Improvements—Electrics Offer Possible Remedy

PROBABLY never in history has the subject of transportation—in all its aspects—been of such vital importance, nor has it ever so occupied the center of popular interest as it does now. And when we speak of transportation, we do not only have in mind the railroad and steamship lines. We think of every link in the entire chain.

While railroad and steamship phases loom large and are of prime consideration, and have therefore come into unprecedented publicity, there are other branches, perhaps less spectacular but of almost equal importance, that require most careful study, for the strength of a chain is determined by its weakest link.

Material must be conveyed to railroads and steamship lines. After same has been carried to some city or port, it must be passed through terminals and transported locally to manufacturing establishments, warehouses, stores, etc., and from such points to its ultimate destination. And finally the refuse must be disposed of. The process is almost unlimited—sort of a circle.

All of this more or less local handling entails the use of enormous facilities and if not properly systematized, great waste and confusion results, a condition which unfortunately exists to a much greater degree than is desirable or necessary.

Terminals may be regarded as the neck of the bottle. Here the greatest congestion with attending delays and waste is found. In those terminals where modern methods have been introduced, the result stands out in vivid contrast to the chaos obtaining in the less organized places.

Extent of Terminal Congestion.

To give a more accurate idea of just what inadequate terminal facilities are in dollars and cents, reference might be made to figures compiled with respect to conditions obtaining in Philadelphia and New York, where the cost of transporting a ton of freight over the 90 miles of rails between the two cities was given at 27 cents, as contrasted with the terminal charges at both ends of $3.65. In other words, it cost about fourteen times more to handle a ton of freight in the two terminals than it did to convey the same volume 90 miles by railroad.

The same figures indicating the cost of handling a ton of freight at the Chicago and New York terminals at 65 cents more than the cost of transporting the ton 1000 miles over the railroad. Volumes could be written about the antiquated and expensive methods employed, but space imposes limitations. However, the foregoing figures will convey some idea as to the necessity for action.

The movement of freight to and from terminals is also susceptible to vast improvement, which, if effected, would introduce far-reaching economies. Considerable losses result from uneven demands on terminals for service. Quantities of trucks simultaneously call for and deliver to terminals freight at the same time, resulting in long lines of vehicles waiting for service. This lack of schedule, and the inability to properly serve trucks, owing to inadequate facilities existing in the terminals, not only blocks the streets but entails considerable monetary loss due to idle investments of waiting trucks.

How Conditions Can Be Remedied.

If the demand on the terminals could be made more reasonably uniform throughout the day, congestion could be minimized and fewer numbers of vehicles and drivers would be necessary. Street congestion would also be lessened. If it would appear impossible to effect a satisfactory working schedule on a co-operative basis amongst the individual trucking interests, then consideration might be given to the idea of having the bulk of such freight handling moved by a relatively few, well organized truck concerns, or to solicit the co-operation of such organizations as express companies who are intimately familiar with the broad subject of transportation engineering, and who also possess relations with the railroads, which would tend to expedite freight handling. Freight in the last analysis is not so vastly different from express, the chief difference being that freight is somewhat more bulky than express and usually is not moved so rapidly. Or some scheme could be worked out whereby the railroads themselves, or operating through a co-operative truck concern, could handle freight directly from the shipper to the consignee, which arrangement would not only tend to eliminate much of the confusion existing, but would also materially make for economies and also release many men for other important duties.

Could Handle Freight at Night.

If some of the movement of freight could be accomplished by night, as seems entirely feasible, improvements of an even higher order would be effected. In fact, the time does not seem so far distant when such methods will be employed, for such scheme has much to commend it.

The traffic problems of the city are becoming increasingly acute. The saturation point must some day arrive. Much heavy hauling by noiseless vehicles could be accomplished at night (in some instances trailers could be employed), and by not having to buck congested traffic, with attending delays, considerable reduction could be effected in operating costs. Traffic congestion during the day would be greatly relieved, and the movement of freight generally could be speeded up.

Suppose the railroads confined the movement of freight to daylight hours and permitted their rolling stock and track equipment to remain virtually idle during the other periods of the 24-hour day. The railroad lines in such event would be inadequate to handle the freight business even though additional trackage were built, great congestion would obtain, and transportation costs would rapidly mount. In these respects the city streets, especially in the busi-

ness districts, are not greatly dissimilar from the tracks of railroads, and it would be easily possible to work out a system whereby the streets, and the large investments incorporated therein, could be utilized by night, as well as by day. The results would be beneficial to all concerned. In normal days, an epoch making development of such character would be difficult to introduce, but perhaps the conditions engendered by the war will more vividly emphasize the necessity of introducing these and other obvious improvements.

Duplication of Delivery Systems an Evil.

Goods, wholesaled and retailed, usually must be transported, and here we have a branch of transportation involving the use of thousands of vehicles, many of which, for the same duty, cover the same territory and are rarely loaded to rated capacity, giving rise to much duplication and unnecessary expense, besides utilizing more equipment and men than necessary, and also tending to further clog avenues of traffic.

The Commercial Economy Board, Council of National Defense, Washington, D. C., has been investigating the subject of co-operative deliveries and has found that when such systems are properly organized and managed, savings of no mean proportions have been effected. We are quite likely to witness extensions of co-operative delivery systems in the not far-distant future, especially if the war continues for a protracted period, for conservation of every phase of industry will of necessity have to be practised.

Heretofore it has been somewhat of a difficult matter to obtain proper consideration of the subject of transportation, and many concerns who would microscopically scrutinize production phases of their businesses have been more or less inclined to delegate the equally important transportation phase to subordinates, who have not always been fully qualified to apply exact engineering analysis in the determination of vehicle selection and operation. It is pretty generally known that the introduction of scientific management in the manufacture or production of commodities, usually preceded by a most searching analysis, has resulted in vast economies being effected. Equal if not greater economies would be obtained in the transportation phase of industry.

High Cost of Delivery Shown.

It is doubtful if the average person has stopped to consider what a large percentage of the total and ultimate cost of a commodity is represented by transportation cost. Following through a commodity from its raw to finished state, with the various and extensive handlings it undergoes before it reaches its final destination the items of cost of transportation represents very large proportions. And anything which can be done to eliminate unnecessary handling and to minimize the transportation cost through the introduction of scientifically correct principles will be favorably reflected in many directions. The yearly savings that could be effected would probably approach the Liberty Bond class.

Heavy Trucking.

A Walker Vehicle 5-ton electric coal truck at Canton, Ill., is hauling a full load in the neighborhood of 25 miles a day from the railroad to the plants of the Canton Gas & Electric Company. The speed averages about 7 miles per hour, at which speed the ampere hour draw on the battery averaged 12.2 for a period of two weeks.

ELECTRICS CAN NEGOTIATE SNOW DRIFTS.

The accompanying illustration furnishes convincing proof that the electric vehicle is not limited to boulevard travel, as is sometimes believed. As a matter of fact, the above country road was impassable to horse-drawn vehicles, and several gasoline cars came to grief in trying to negotiate the snow drifts.

Electric Vehicle Negotiating Snow Drifts on Country Road.

The electric vehicle should not be advocated as a touring car, but nevertheless it is a satisfaction to owners to realize that country driving, even over poor roads, is possible without inconvenience.

PLAN PROPOSED TO RELIEVE FREIGHT CONGESTION IN NEW YORK.

Opportunities for Electric Trucks Seen in Suggestions Offered by Traffic Managers.

The organization of a city-wide trucking system to make store-door deliveries of less than carload freight immediately upon its arrival at railroad terminals and to make store-door collections of less than carload freight was considered at a meeting of traffic managers of the railroads entering New York City. The creation of such a machine was discussed at a meeting between the railroad managers and representatives of the business interests of the city.

The plant put forward was for the creation of an authority which would commandeer the trucking facilities of the whole city and use them for the movement of all small freight. It had been suggested that the railroads take over this work, and, instead of delivering less than carload freight at terminals to be held at the pleasure of the consignee, to deliver to stores and warehouses, making an additional charge to meet the added cost. This plan has been adopted in England, where it has worked well.

If less than carload freight was delivered immediately upon arrival, and the carload freight disposed of promptly under the new embargo-permit system which went into effect, the managers said that congestion of domestic freight would be prevented. While the managers were not ready to go on record formally as indorsing the plan, there was a strong sentiment in favor of it. There are 100,000 tons of freight on the piers of the New York Central Railroad, and the accumulation of freight at the terminals of all of the roads entering New York amounts to hundreds of thousands of tons.

At present if a firm in the middle of Manhattan got an order for a shipment weighing 200 pounds, it

is probable that a truck would be sent to a downtown pier with that shipment. This truck, with a capacity of 3,000 pounds, would make the trip downtown carrying one-fifteenth capacity, and would probably make the trip back empty. Under the proposed plan, this truck would take on a full load uptown before starting for the pier or railroad station, and, after unloading, would proceed to bring back a full load of freight for distribution.

While some business men are in favor, others are opposed to the new plan, but the majority told the railroad men they were of an open mind. The New York Board of Trade and Transportation has made a canvass of 500 business houses as to their attitude on the proposed delivery plan, the questionnaire stating that the proposition was for the railroads to take over the trucking work. A number of firms, typified by Wing & Son, piano manufacturers, thought there would be a danger to the handling of delicate machinery. Some, like Edward D. Depew & Company, said that the question of proper trucking charges would be a formidable one. Turstton & Braidich, drug importers, said that many of their shipments were made on telegraphic orders, and that in the proposed system there were dangers of delays. McCormick, Hubbs & Company said the plan would not work in the matter of handling vegetables and fruit, pointing out that in zero weather the immediate delivery by truck of fruits and vegetables would mean a great loss. Many business houses canvassed took the stand of B. Altman & Company, who wrote:

"There are some features of the plan on which we would like enlightenment. What arrangements would be made concerning freight which appears to be pilfered or damaged? If such a shipment were returned it might result in further congestion. It would be manifestly unfair to ask the consignees to accept freight in such condition. The nature of our business requires that we receive freight only during certain hours of the day. It is a question whether this feature could be taken care of under the plan."

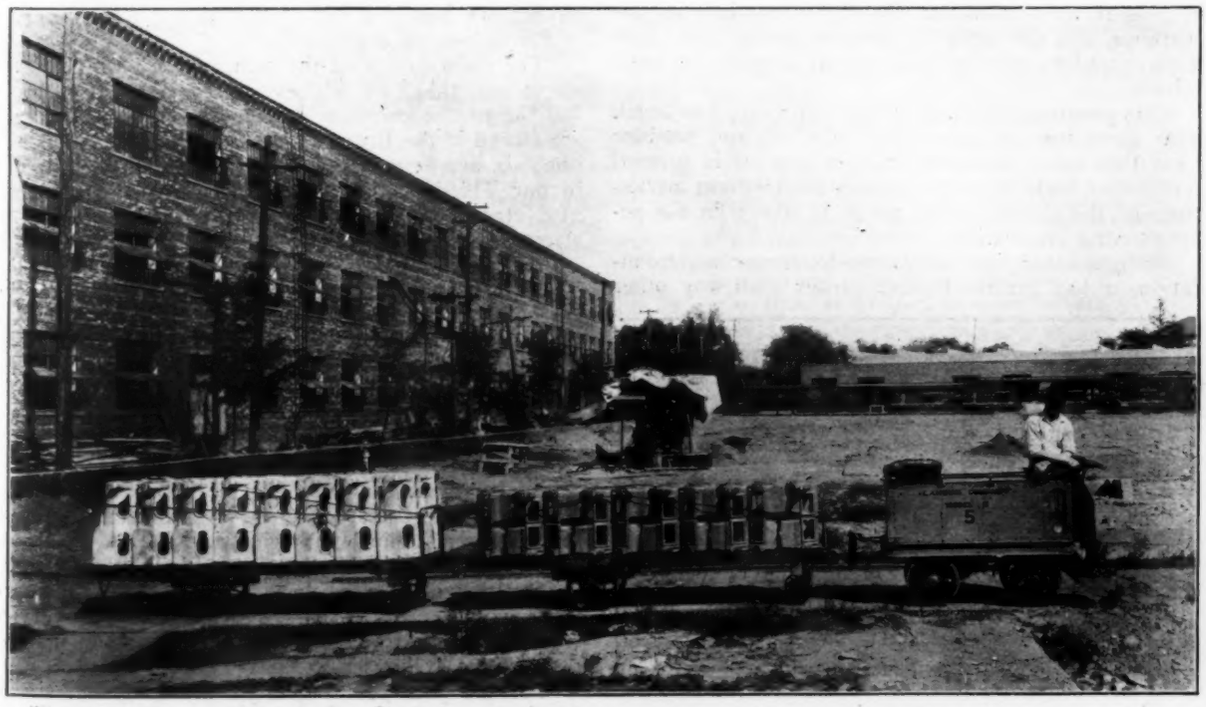
Railroad men said that under the present plan there is a system of notification of the arrival of freight which makes a day or more delay, and then consignees are disposed to send for their consignments when they need the goods. Leaving goods in railroad warehouses and on piers is about the cheapest form of storage consignees can obtain. The proposed plan, it was said, would end this abuse.

ELECTRIC TRACTORS IMPORTANT FACTOR IN SPEEDING-UP PRODUCTION.

Savings in Time and Labor Accomplished by Electric Method in Industrial Plants and at Terminals.

There was never a time in our industrial life when there has been a greater need for conserving time and labor than at present. The many inefficient and wasteful methods, born of abundant supply and easy money, have now been relegated to the past and our great industrial activities are being placed on an efficient basis.

The scarcity of labor and the coincident high wages demanded for even the most menial duties have led to very remarkable improvements in all operations where manual labor has been heretofore employed. Particularly in industrial plants, where large forces of men have been needed for handling material from one machine or department to another, has there been a need for reorganization. In many cases it has been found profitable to rearrange machines to minimize the amount of handling; in a majority of instances, however, the solution has been in the employment of electric tractors and trailers, and this practice is rapidly extending. Also at docks and freight terminals, where unprecedented congestion has seriously hampered our war preparations, electric tractors and electrically operated freight handling machinery have been very extensively and successfully employed. Statistics prove that the electric industrial truck can replace from three to five men, which are thus released for



Electric Tractor Hauling Trailers Loaded With Automobile Castings.

meeting unusual demands for men—and more men, and these economic units also show an increase in the handling speed.

New uses for the industrial truck are constantly being found. Several years ago the Government adopted them for use in our arsenals, and following England's precedent, practically all of the factories making munitions are now using these "electrics" and are finding them indispensable. The most overworked industry during the last two years has been the munition industry, and it has probably suffered most through lack of men, and yet, with the aid of electric industrial trucks it has been possible to tide over the labor scarcity. Some manufacturers accomplished this through the use of conveyors, but the munition men found that the storage battery truck met their requirements much more suitably, first, because the electric industrial truck could do all and more than a conveyor at a much less cost; second, because there was the danger of friction with conveyors; and third, they are more mobile. Special models have been designed with separate compartments for the transportation of shrapnel and other shell, and large numbers of these trucks are being operated in England by women, thus further releasing man power.

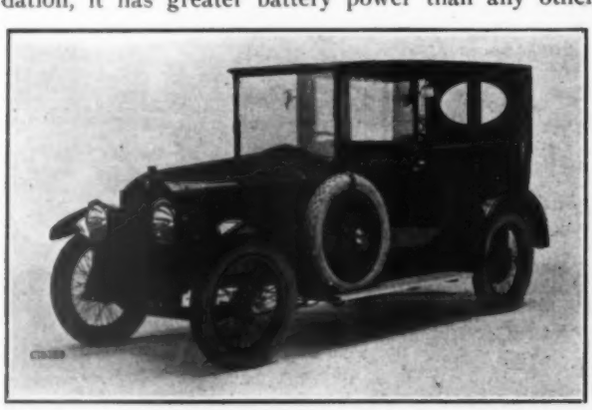
A typical instance of the adaptability of the electric tractor is shown in the accompanying illustration. A tractor, manufactured by the Lansing Company, Lansing, Mich., is hauling trailers loaded with automobile castings. Formerly this work was done by hand.

MILBURN ADOPTS GASOLINE-CAR BODY DESIGN.

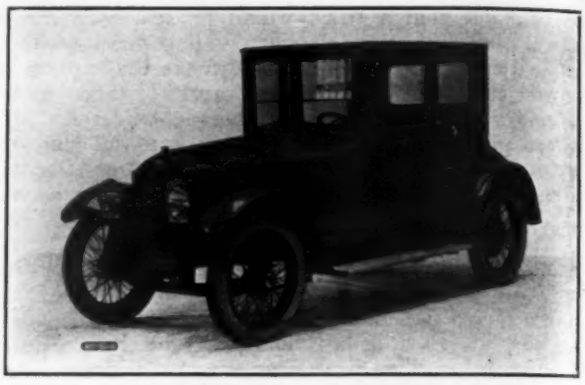
The many advantages of the electric passenger car, such as ease of operation, absence of trouble, cleanliness, etc., have appealed very strongly to women and this has undoubtedly led to manufacturers adhering to a peculiar style of body design that is much more attractive to women than to men. However, there is nothing feminine about an electric, unless it is its appearance, and the same advantages which have made it so popular with women appeal equally to male drivers.

One progressive manufacturer determined to break away from the old conventional designs and produce a car that would approach the gasoline car in general appearance and, of course, retain the inherent advantages of the electric. The result is shown in the accompanying illustrations.

Designed for five and seven-passenger accommodation, it has greater battery power than any other



Milburn Electric Town Car.



Milburn Electric Sedan.

electric car and, with the motor and chassis equipment in proportion, will have a wonderful range of speed and mileage.

The car illustrated will have divided front seats, wheel steer, with electrical control on the wheel, left-hand drive, long wheel base and many features in common with the modern high-priced gasoline car, yet in weight will be under many electrics of the old style.

HOW NEW YORK EDISON USES ELECTRIC TRUCKS.

Description of Classes of Work Handled Successfully by Battery Vehicle.

The New York Edison Company has been a consistent user of electrics for many years. In 1903 12 cars were put into service. This installation was so successful that more cars, both passenger and commercial, were purchased at frequent intervals until at the present time over 137 electrics are in daily use. This fleet includes the 12 veterans with 14 years of constant service to their credit. Two of the one-ton cars of the 1903 vintage have an especially fine record, having lost hardly a day's work except when brought in for occasional overhauling.

The main garage of the company is located at 41st street and the East River, and houses nearly three-fourths of the company's fleet. From 19 to 20 cars are stored in the Bronx at 140th street and Rider avenue; six are kept at the 107th Street Station for use in our Third District; ten passenger vehicles are at 21st street; one emergency wagon is at 55 Duane street and a second one at 149 East 26th street.

All the cars are under the supervision of the Transportation Department and are charged to the various departments for the work handled each day at so much an hour, depending on the truck. The types of trucks assigned to these departments and the variety of work done is indicated as follows:

Distribution Department.

Ten of the company's five-ton trucks are used by this department for pulling cable in ducts, overhead work, and also transporting cables and other material, and are all equipped with electric winches. Half of the cars are used in Manhattan and half in the Bronx.

In the two-ton class there are five trucks which are used exclusively for carrying material for service work at junction boxes in the streets, and in making connections at houses.

All the 3000-pound cars of the company, six in number, are employed to transport meters. These

cars have specially built bodies with bins for the meters, and are padded with mats to prevent injury from jarring.

Two one-ton cars act as emergency wagons, and are always kept loaded with material for making emergency underground repairs. Twenty other one-ton trucks are employed in delivering material for work in progress in the streets, installing service in houses, and carrying splicing and other material. One car of this size acts as an emergency wagon in the Bronx.

Two three and one-half-ton and one three-ton truck are used for overhead line work in the Bronx and have booms for setting poles.

Storeroom Department.

A fleet of 39 lamp wagons is assigned to this department, and, as the name of the cars implies, the work is the delivery of incandescent lamps to customers. This department also has one 2000-pound car used exclusively for delivering stationery and another car of this type to transport materials between all the storerooms and stations of the company.

Meter Test and Arc Department.

The work of this department should really be considered under three separate divisions, meter and meter test work, arc lamps, and testing of machinery and materials. In the arc department work there are four 2000-pound wagons equipped with electrically operated elevating towers for the inspection and repair of arc lamps. Two of these cars make their rounds in daytime and two at night, thus acting to a large extent as emergency wagons. Two one-ton cars deliver supplies, and do other general work such as bringing material for the pole-setting truck of the department. This last named car is a three-ton affair with a boom for setting arc-lamp posts in the streets.

A two and one-half-ton truck is used for hanging commercial signs and lamps. This is another of the "old timers" and dates back to 1903.

A one-ton wagon is used for laboratory work by the test department in carrying feeders, machines or materials which are to be tested. The meter department also uses one of these cars for transporting meters to be tested and for general hauling to the meter storerooms.

Inspection Department.

A 700-pound wagon delivers electric irons and other heating apparatus in Manhattan and the Bronx, leaving them on trial and collecting those not purchased.

Transportation Department.

The transportation department itself has four cars regularly assigned to it for general work—a 700-pound wagon, a one-ton, a two-ton and a five-ton. It should be understood also that when any of the cars ordinarily used by any department are not needed, they are employed by the transportation department in hauling supplies or re-assigned to some other specially busy department.

In addition, to this fleet of trucks, there are 13 superintendents wagons which are used by the foremen and superintendents in the supervision of various jobs all over the city.

The passenger car equipment is composed of 23 cars, 10 of which are kept at 21st street, and the remainder at the main garage. These vehicles are invaluable to the officers of the company in making numerous trips about the city.

The work of the company being confined to Manhattan and the Bronx, it is natural that the mileage requirements of all the cars should be very small. The average mileage for passenger cars as shown by records for one year of 303 working days was 19.8 miles a day. The mileage for the trucks and delivery wagons was also small; for the 700-pound wagons, 13.9 miles; for the lamp wagons, 15.8 miles; for the one-ton trucks, 21.5 miles; for the 3000-pound trucks, 20.8; for the two and one-half-ton, 3-ton and three and one-half-ton cars, 12.9 miles; and for the five-ton trucks, only 12.5 miles.

As to the makes of cars used: The New York Edison Company has representatives of nearly every variety of car made. In addition to the cars purchased complete from the manufacturers, a few have been assembled very successfully by their own workmen. Repairs, rebuilding and assembling are all done by their own men at the main garage.

HIGH STANDARD OF ELECTRIC GARAGE SERVICE SHOWN.

Electric Vehicle Owners Offered Many Conveniences Not Available to Other Drivers.

The accompanying illustration is a reproduction of a service code issued by a Chicago electric vehicle garage to its employees and indicates the character of service which is typical of such establishments. Serv-

Bland Electric Garage

416-418 East Forty-seventh Street
Chicago, Illinois

Rules for Drivers of Electric Cars

1. Report for duty on time, in a neat and clean condition. Show your respect for the car owner, who often rides with you
2. It is your duty to report all Car imperfections to the foreman.
3. Always fold up rug before entering Car.
4. Switch off all car lights on entering Garage.
5. Examine car thoroughly for damages, notify car owner of damage before bringing car into garage.
6. Always remember that you are not handling your own property and you should care for it as you would your own. As the car owner is your best friend, he makes it possible for you to hold your position.
7. Do not deliver a car under any circumstances that is not thoroughly clean and in first-class condition.
8. To use Liquor while on duty means your discharge.
9. Smoking in owner's car means your discharge.
10. Carrying your friends in owner's car means your discharge.
11. Exceeding the speed limit of Third speed without owner's permission, means your discharge.
12. Driving on car tracks means your discharge.
13. Carrying home owner's key means your discharge.
14. In driving owner's car attend strictly to your own business. He does not want you to entertain him. He knows that you are a practical automobile man, without you telling him.
15. Strict attention to the above rules will afford the car owner perfect service and will make it possible for you to hold a remunerative position.

Bland Electric Garage

ROBT. BLAND, Prop.

Instructions Issued to Employes of an Electric Vehicle Garage Indicating Service Which Owners Receive.

ice in an electric garage in most cases includes battery charging, periodic battery inspection, oiling and greasing, washing and polishing and delivery of the car to the users' premises when desired.

In Chicago, the garages, through the local electric vehicle association, have provided a parking service in the downtown district, which provides for an owner leaving his car in charge of the association at Grant Park, and having it delivered to him at any point in the business district at a specified time. This service overcomes the hardships of the "parking" ordinance in Chicago which prohibits parking entirely during certain hours and limits it to one-half hour periods during the remaining hours.

NEED FOR A STANDARD SYSTEM FOR RECORDING MOTOR TRUCK OPERATING COSTS.

Use of Motor Trucks Would Receive Great Impetus if Present Uses Would Keep Accurate and Uniform Operating Costs.

By S. V. Norton.

Perhaps one of the most urgent needs of the motor-truck industry today is for a standard system of keeping track of truck operating costs. A large number of truck operators are either not making or not saving the money they should from their trucks. Many of them are actually losing money. Why is this? Simply because truck owners have been too busy delivering their goods to ask themselves, first, what does it actually cost me? and, second, what ought it to cost?

With the necessity for war-time economics the need for keeping track of motor-truck costs is more urgent than ever. In the past many cost systems have been devised and distributed to motor-truck owners and while these systems were generally compiled by experts and were complete, they were not uniform and different systems treated various items of expense in different ways.

A standard system, setting down a uniform method of figuring truck costs, would provide a common language by which the experience of all truck operators in the country could be related and understood.

It would unlock a great storehouse of information which is at present closed to the truck owner.

Any individual system, however well designed, cannot serve the motor-truck industry adequately so long as several other cost systems, which also may be well designed, are in existence. The difficulty comes from a lack of uniformity in the treatment of various items of expense. Truck owners who use systems which have been compiled by authorities on motor-truck accounting or by general expert accountants, and which are generally complete, show results which are not subject to comparison because of varying methods of computing identical items. There are, for instance, at least four methods of figuring depreciation.

Two truck operators, A and B, use systems devised by competent accountants. A's cost system provides that depreciation shall be figured at 20 per cent a year, charging off the entire cost at the end of five years, but B's system declares that depreciation must be figured on a mileage basis, allotting 80,000 miles as the expected life of the truck. Both operators use cost systems devised by experts yet the difference in computing this one item alone may amount to $100 or $200 a year.

If all or even the great majority of truck owners began to figure depreciation according to the standard formula, an enormous gain would be accomplished, for a common denominator would be established by which one truck could be compared with a thousand trucks in respect to this item.

A well conceived motor truck cost system should reveal:

Number of trips.
Customers or deliveries.
Total loads in units.
Average load in units.
Miles traveled.
Round trip distance.
Unit—miles.
Miles per kilowatt-hour of electricity, or gallon of gasoline.
Miles per gallon of oil.
Standing time at plant in hours and minutes.
Running time in hours and minutes (including stops).
Average loading time per trip.
Average speed in miles per hour.
Estimated running time per mile.
Estimated time per customer's stop (in minutes).
Cost per day (at work).
Cost per mile.
Cost per unit load.
Cost per unit mile.

Now suppose a standard system were adopted and widely used which would enable a great many truck operators to compute these items in the same way. The benefits to truck users would be enormous. A comparison of figures would bring to light many possibilities of economy, as well as many causes of waste. Expensive methods would have to go, time-saving and money-saving ideas would spread throughout the truck using public.

The reports from dozens, perhaps hundreds of truck owners, rendered in a uniform way, would tell a convincing story. They would establish proof where heretofore there was guess work.

Consider the matter of maintenance or repair. Every reputable truck maker is searching constantly for information which will enable him to perfect his product. The world is his laboratory and he would like nothing better than to receive reports from all his customers which would describe the shortcomings and lay bare the weak points of his truck. Unfortunately this information is not yet available to him except in fragmentary form. And even in those rare cases where he does receive the complete history of an installation, the story is apt to be, as it were, in a "foreign language," which must be translated or interpreted before it can be of use. The same may be said of the maker of parts.

ELECTRIC TIPPING VAN USED IN ENGLAND.

The electric vehicle is making such rapid progress in England that the local authorities, railway and transport companies, manufacturers, merchants and others have found it so useful for a variety of purposes that it is being employed for an ever widening circle of commercial and industrial work. Many local authorities, especially those who own electricity works, are becoming users of the electric vehicle. The latest converts are the Kettering Urban District Council, to whom the General Vehicle Company (Ltd.), of Imperial House, Kingsway, W. C., recently supplied a 3½-ton electric tipping van, as it is called abroad, or dumping body for the conveyance of coal.

New Appliances

Fan Accessory—New Knob—Washer—Picture Machine—Heat Regulator—Heaters—Kitchen Machines—Socket

Detachable Oscillating Mechanism for Converting Sprague Desk Fans to Oscillators.

The great popularity of oscillating fans has led the Sprague Electric Works of General Electric Company, New York City, to so design its oscillating mechanism that it can be readily attached to any of the Sprague non-oscillating desk fans made within the past nine years, thus converting them to the oscillating type. All that is required is to simply remove

Oscillating Mechanism That Can Be Easily Attached or Detached.

the rear bracket from the ordinary fan and replace it by the oscillating mechanism with which it is interchangeable. It has found that this feature is a valuable one in that the fan, by being so easily changed from one type to the other, is much more useful than if it is only adapted to one or the other service.

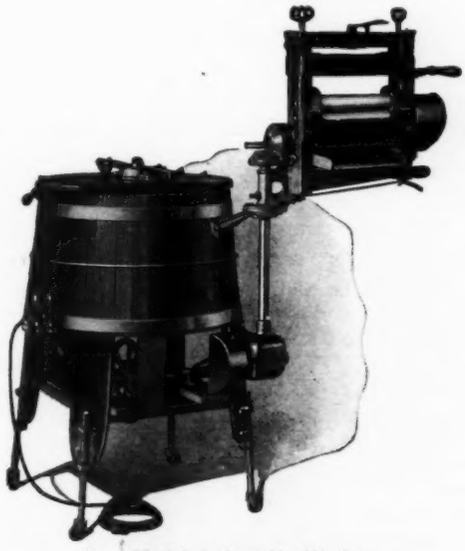
A New Assembled Knob.

The electrical contractor and wireman has a great deal of trouble in knob-and-tube construction in keeping track of separable knobs, the parts of which seem determined to be lost. To overcome this difficulty much study has been given by one of the manufacturers with the result that an assembled knob of a new type is now placed on the market. It is known as the Newedge assembled knob and is unique in that the parts are held together by steel washers secured on the nails. This represents a great deal of saving in shipping knobs to the work and in placing them permanently in use. The manufacturer claims this method is decidedly superior to holding the knob together by crimping the nail, which weakens the nail. The accompanying illustration shows the well known "Wedge" No. 5½ split knob, together with a leatherhead under the head of the nail. These devices are manufactured by the Cook Pottery Company, Trenton, N. J.

Newedge Assembled Knob.

New Models of Electric Washers.

The Automatic Electric Washer Company, Newton, Iowa, has placed on the market two new models, 9 and 10, one of which is illustrated herewith. These represent improvements in its line of dolly-type wooden tub machines. Model 9 is built for belt connection to a gasoline engine or other power operating a farm lighting plant. Model 10 is built for motor drive, electric power for which may be from any available source, including a farm lighting plant. The new model machines are low-priced washers with swinging



New Model Automatic Washer.

wringers, the latter swinging into four different positions, the washing and wringing going on at the same time. The electric machines are equipped with Emerson motors.

Automatic Motion-Picture Machine.

A new type of motion-picture machine for office, convention, and show window use has just been brought out by the Automatic Motion-Picture Machine Corporation, New York City. This machine displays pictures which can be readily seen even in broad daylight. Its operation is entirely automatic. After the reel is run through it is quickly rewound and then displayed again, so that after the machine is arranged and started it will continue to operate indefinitely with no further attention.

The outfit consists of two separate parts, the moving-picture machine and a miniature theater in which

the pictures are displayed. The picture machine is operated by a standard Westinghouse universal motor, which will operate on either direct or alternating current. Two horizontal disks carry the film, which passes in one direction for projection and is reversed for rewinding. A 400-watt Mazda projection lamp furnishes the light, which is automatically extinguished when the machine stops and during the process of rewinding. All parts of the mechanism are made from an aluminum composition so the machine weighs only 35 pounds.

The moving-picture machine is placed about a foot away from the theater and so that the light enters an aperture in the base. Here it strikes a mirror set at an angle of 45 degrees and is reflected upwards onto a screen set in what would be the stage. Another 45-degree mirror reflects an image of the screen, making the picture appear to the audience to come from a screen on the rear wall of the theater.

Standard non-inflammable films in lengths of from 75 to 500 feet can be exhibited. The outfit is approved by the National Board of Fire Underwriters.

Western Electric Heat Regulator.

There never was a time when so much attention was directed to the conservation of heat and coal. The acute coal situation, which called for a drastic regulation compelling shutdown of industrial and commercial plants, emphasizes the importance of considering any means which will conserve fuel and heat produced thereby.

With many present supplies of coal, a house-heating plant if not constantly attended will produce after fresh firing an excess of heat, which of course is pure waste, and then again the fire will go down and the rooms become chilly. The result is that an excessive amount of coal will be necessary to again restore the rooms to proper temperature with a likelihood that surplus heat will again be developed before long.

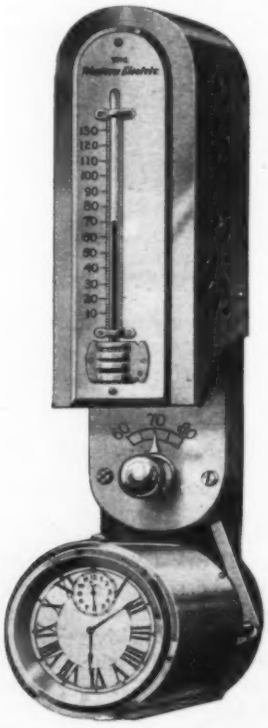


Fig. 1.—Thermostat for Western Electric Heat Regulator.

Fig. 2.—Complete Heat-Regulator Outfit No. 100, Including Spring-Motor Box, Thermostat, Wire, Chains, Pulleys, Brackets, Etc.

Aside from this wasteful method of operating the ordinary house boiler or furnace, the alternate excess heat and chill of the rooms is far from comfortable and may even become decidedly unhealthful.

To overcome these difficulties there has been placed on the market a heat regulator of simple and unique construction. It is the result of careful development work and has been tried out with complete success. This heat regulator consists of two parts. The part shown in Fig. 1 is the thermostat and includes a thermometer which controls a low-voltage regulating circuit. In the middle portion of the device is an adjustment, by means of which the normal temperature can be set to the point desired. The bottom of the device is a clock which acts as a convenient auxiliary in the manner to be described below. The second part of the device consists of a box inclosing a motor that operates chains for controlling the inlet and check dampers of the furnace or boiler being regulated. The motor is controlled by the thermostat.

The action of the regulator is as follows: Suppose it is set to maintain 70 degrees. A change of as little as one degree from this causes an electric impulse to be sent to the motor box near the boiler or furnace and the motor in this opens and closes the drafts as required. If the temperature in the room increases the motor closes the inlet damper and opens the check damper, whereas a decrease in temperature in the room causes the inlet damper to be opened and the check damper to be closed.

The device is made in two types. The one known as No. 100 is made for houses that are not wired for electric light. In this case the motor in the operating box is a spring motor that can be wound at periodic intervals by means of a crank fixed at the right of the box. The control circuit in this case is supplied from two dry cells. In houses wired for electric light the No. 200 set is furnished. This includes a small 110-volt motor for operating the dampers. For the control circuit in this case a small bell-ringing transformer is supplied, which furnishes 6 volts to the thermostat circuit, no dry cells being required.

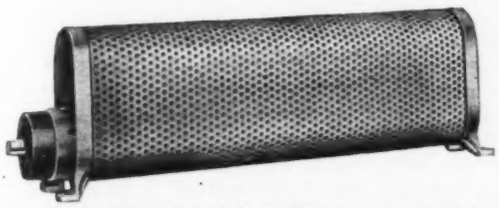
From the foregoing brief description it is evident that this regulator is extremely simple and, it may be added, that it is quite moderate in price. The equipment installed in the room is neat and the entire installation can be made by any electrical contractor in a few hours, whether the house is wired or un-

wired. The clock supplied permits maintaining a lower temperature during the night and at a predetermined hour set on the clock the thermostat will automatically open the inlet draft, so that the furnace will warm up the house to a comfortable point when its occupants are ready to arise.

This device is being placed on the market by the Western Electric Company and is being offered to electrical contractors at a very satisfactory basis. A special sales campaign has been inaugurated by the company, backed by very extensive advertising in national mediums.

New Electric Air Heaters Meet Needs Created by Coal Shortage.

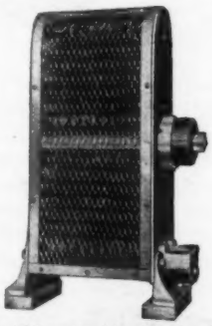
The long anticipated and now serious coal shortage has caused industrial men to use their available supplies of coal primarily for power production; looking at the same time for supplements for use in heating. The Cutler-Hammer Manufacturing Company, Mil-



Type H, Three-Kilowatt Air Heater Unit. Handsomely Finished for Use in Office or Home.

waukee, Wis., forseeing this tendency has developed and is now marketing a new and improved line of electric air heaters designed to supplement the furnace or steam-heating system in the home, office, store, factory or large industrial plant.

Electric air heaters are found useful in heating crane cabs, outhouses, valve, pump and meter houses, exposed remote corners or rooms, watch or signal towers, for shear men and table men in steel plants, in theater ticket booths, as well as for scores of mis-



Open-Coil Type, Two-Kilowatt Heater for Use Where Powerful Heater with Small Base Is Desired.

cellaneous applications and in such uses they effect a distinct saving in coal. Flexible electrical conductors will carry heat cheaply and efficiently to the most inaccessible points.

The new C-H electric air heaters are self-contained, easily moved from one point to another, and possess the inherent advantages of all electrical heating devices: heat under perfect control and absolute freedom from dust, ashes, soot, unpleasant odors and vitiation of the air. The perfect control possible allows efficient use of the heat; as soon as a location is warmed, a turn of the switch cuts off the current and the heater can be moved to warm another part.

Grid-Type, Five-Kilowatt Mill Heater for Use Where Heat Is Desired Without Ornament or Frills.

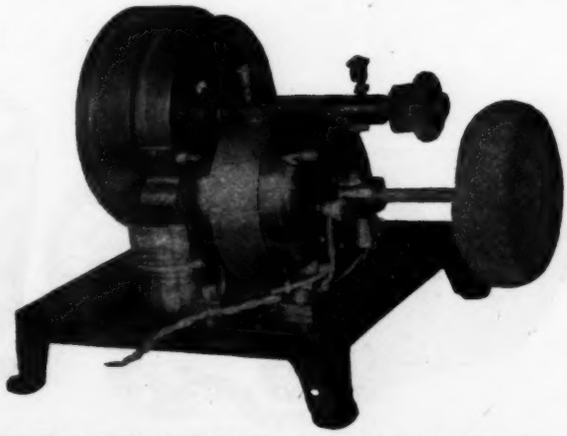
Users find the new electric air heaters economical and efficient supplements to their existing furnace or steam-heating systems. In central stations, large steel mills and other great industrial establishments maintaining large generating plants and delivering electrical energy at a cost of not in excess of one or two cents per kilowatt-hour, it has been found economical and convenient to use electric heaters entirely.

C-H heaters are made in various shapes, sizes and capacities and a heater to fit almost any space or condition of mounting may be selected. Several types are shown in the accompanying illustrations.

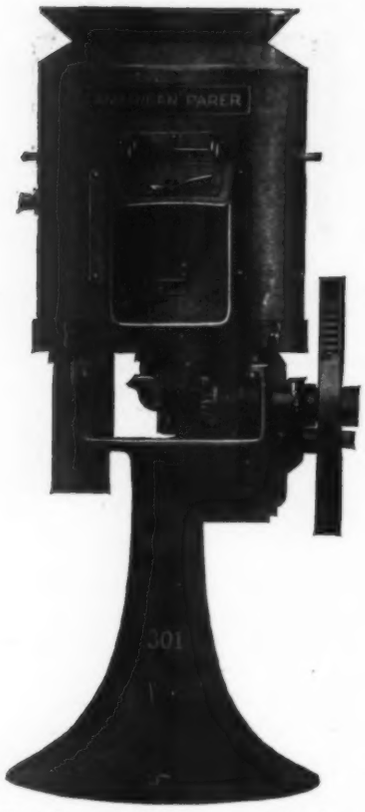
Electric Knife-Cleaning, Vegetable-Paring and Other Kitchen-Utility Machines.

In a restaurant, hotel, club, hospital or other large establishment called on to feed many persons it is necessary to use efficient methods in the preparation of all food and in washing dishes and cleaning silverware, etc., else the number of assistants necessary for doing the menial work of the kitchen would become prohibitively large. Electrically driven machines solve the problem most satisfactorily, due to their cleanliness, readiness for action, economical and quiet operation and other lesser advantages. The accompanying illustrations show two new electric kitchen-utility machines that are of timely interest because of the growing shortage of labor and the need for efficient preparation as well as utilization of food.

The Ernest Koeppen organization, of New York City, has developed a motor-operated knife-cleaning and silver-buffing machine. According to the motor supplied, it can be used on 110 or 220-volt direct-current or alternating-current circuits. The complete device consists of a pair of patented cleaning or polishing brush disks and a fractional-horsepower motor, which drives the disks through gears and also has a



Electric Knife-Cleaning and Polishing Machine.



Electric Vegetable Parer and Washer.

buffing shaft extension for the buffing of light silverware or coffee or tea pots, etc. Knife cleaning takes place between the brush disks in the inclosed drum on the left side of the motor. The cleaning or polishing brush disks will, it is claimed, serve several hundred thousand knife blades without renewal which is done at a low cost. The butt of the knife handle is polished by the special attachment at the right end of the back-gear shaft.

The American Machinery Company, Philadelphia, Pa., has developed motor-operated machines for simultaneously paring and washing all hard-root vegetables. These machines are extensively used by the United States Government in the Navy, Army and other institutions. They remove the outer skin of the vegetables and turn them out ready for cooking. The machines are made in a variety of sizes suitable for use in restaurants, hotels, hospitals and kitchens of various kinds.

The American Machinery Company has also designed a number of motor-operated machines for other purposes and its carton-folding and sealing machines, container-sealing machines and automatic scales are largely used for commodity weighing where goods are marketed either in the package or carton form.

Power for the various types of machines referred to is obtained from fractional-horsepower motors manufactured by the General Electric Company. These motors are regular equipment for these machines. The motors are inclosed and are moisture and dustproof either in direct-current or alternating-current types to meet the service conditions.

New Benco Pull-Chain Socket Approved for Use as a Weatherproof Device.

The Benco pull-chain socket has been in process of building for several years. This socket has been on the market for a while but, nevertheless, has remained in its experimental stage until the present time.

The pull member of this socket differentiates from all others in that it is vertical and direct in action. The chain passes down inside the socket, completely insulated from live parts of the device which are molded in an insulating composition. Recently this socket was subjected to the severe test given to devices of this kind by the Underwriters' Laboratories, and approved for use in damp places on account of the high insulation and the good protection from moisture.

The shell in the weatherproof form of this socket is made in either aluminum or copper. The asbestos composition base of the molded parts is non-absorptive, so that there is no possibility of the molded portions becoming conductors from the live parts to the pull member. The composition of the molded parts will withstand a considerably higher temperature than the socket will ever reasonably be subjected to in service.

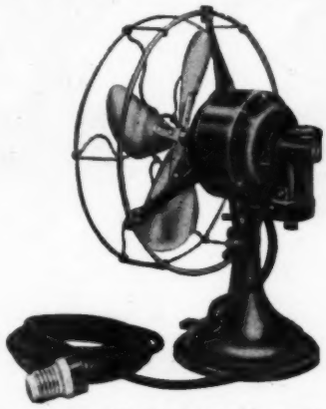
These sockets are provided with a special lamp-grip feature which prevents lamps from falling. The device is approved for a rating of 660 watts, 250 volts, and the operating mechanism is of a quick-make-and-break type.

The threaded portion at the base of the shell is designed to receive all of the Benjamin type S fixture connectors and reflectors. These Benco sockets are manufactured by the Benjamin Electric Manufacturing Company, 120-128 South Sangamon Street, Chicago. They should find considerable application in the damp rooms of industrial establishments, such as packing houses, breweries, dye houses, tanneries, etc.

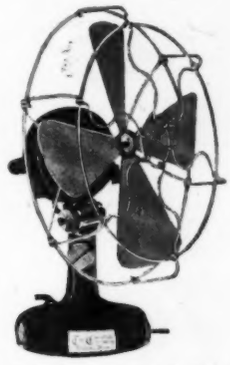
Views of Benco Pull-Chain Socket and of its Parts.

New Electric Fans

Assortment of New and Improved Types of Fan Motors Being Marketed by Leading Manufacturers This Year



Century 9-inch adjustable oscillating fan. Drawn-steel motor casing and stand. Alternating current only. Century Electric Company, St. Louis, Mo.



Carleton 6-inch desk and bracket fan. Now made with ball-and-socket universal joint. Universal motor for direct and alternating current. The Carleton Company, Boston, Mass.

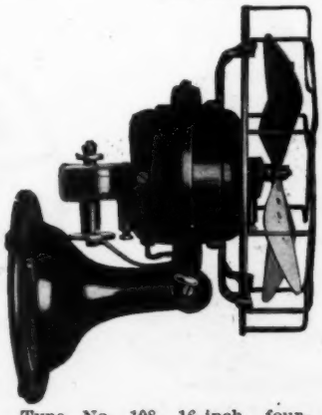
Eight-inch, two-speed Model 28 fan. Universal series motor. Drawn-steel frame with adjustable hinge joint. The Robbins & Myers Company, Springfield, Ohio.

F 50

Style B, 56-inch, direct-current ceiling fan. Changed to smooth-surface design. Three-speed switch. Alternating-current fan is Style H. The Robbins & Myers Company, Springfield, Ohio.

Model 21, 12 and 16-inch, non-oscillating, alternating-current, desk and bracket fan. Induction motor. Drawn-steel frame. The Robbins & Myers Company, Springfield, Ohio.

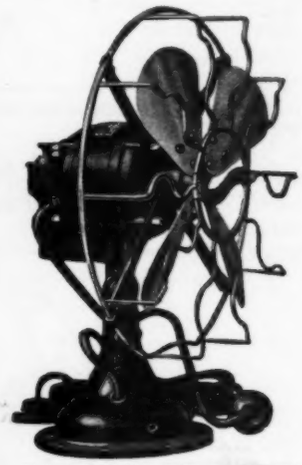
Type No. 164, 8-inch, non-oscillating, desk and bracket fan with universal motor. Net weight 7 pounds. Black finish throughout. Also made as oscillator. Tideman Electric Manufacturing Company, Cairo, Ill. (Formerly known as Menominee Electric Manufacturing Company.



Type No. 108, 16-inch, four-blade, direct-current oscillator in bracket position. Black japan finish, except lacquered brass blades. Also made in 12-inch size. Tideman Electric Manufacturing Company, Cairo, Ill.

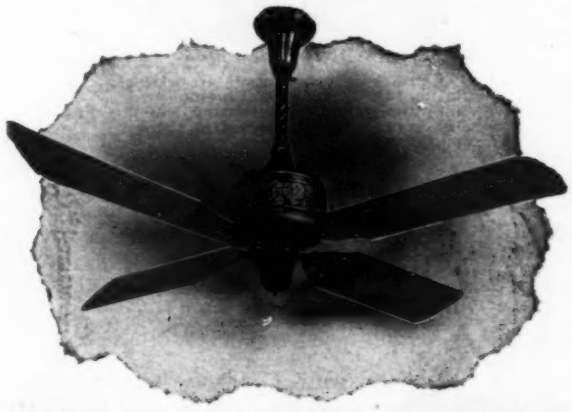
Ten-inch direct-current non-oscillating fan with drawn-steel frame. Zinc-plated, polished and lacquered blades. Other parts dull black. Also made in 12 and 16-inch sizes with lacquered brass blades. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Westinghouse "Whirlwind" 8-inch alternating-current desk and bracket fan. Drawn-steel frame and plain finish. Single speed and no switch. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

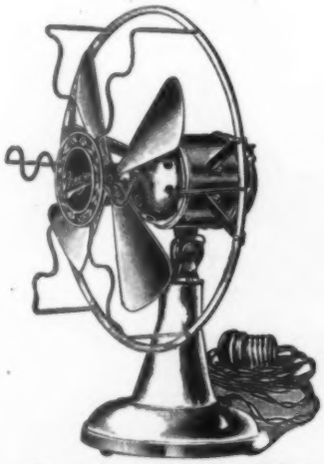


Ten-inch alternating-current oscillator for desk or wall mounting. Oscillation adjustable from 45 to 90 degrees and may be locked out. Drawn-steel frame. Zinc-plated, lacquered blades. Westinghouse Electric & Manufacturing Company.

Ceiling-type gyrating fan. 12-inch side fans adjustable from horizontal to 35 degrees below. One motor geared to central gyrating mechanism. Also made for floor mounting. Westinghouse Electric & Manufacturing Company.

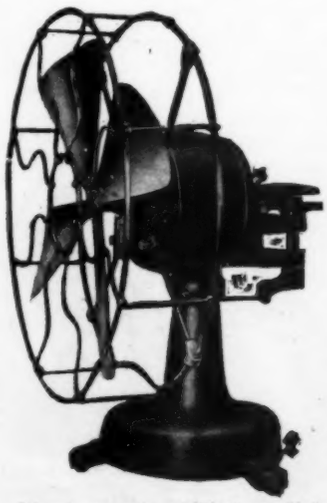


Fidelity type B direct-current ceiling fan especially adapted for 12-foot ceiling height. New oilless bearing. Switch at bottom. Speed 180 revolutions per minute. Also made for two speeds and with electrolier attached below. The Fidelity Electric Company, Lancaster, Pa.



"Breezer" 8-inch universal desk and bracket fan. Made for voltages from 8 to 220. Weight 6 pounds. Polished nickel finish throughout. Blades and armature specially balanced. Three speeds. Lindstrom, Smith Company, Chicago, Ill.

"Chicago" No. 64 8-inch non-adjustable desk fan with universal motor. Made for voltages from 12 to 220. Body and base finished black; blades and guard polished nickel. Lindstrom, Smith Company, Chicago, Ill.

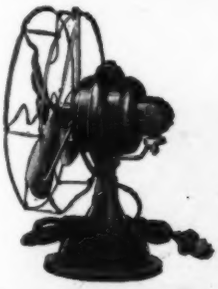


Direct-current oscillating desk fan made in 12 and 16-inch sizes. Black enamel finish with brass trimmings. Also made for wall mounting. The Fidelity Electric Company, Lancaster, Pa.

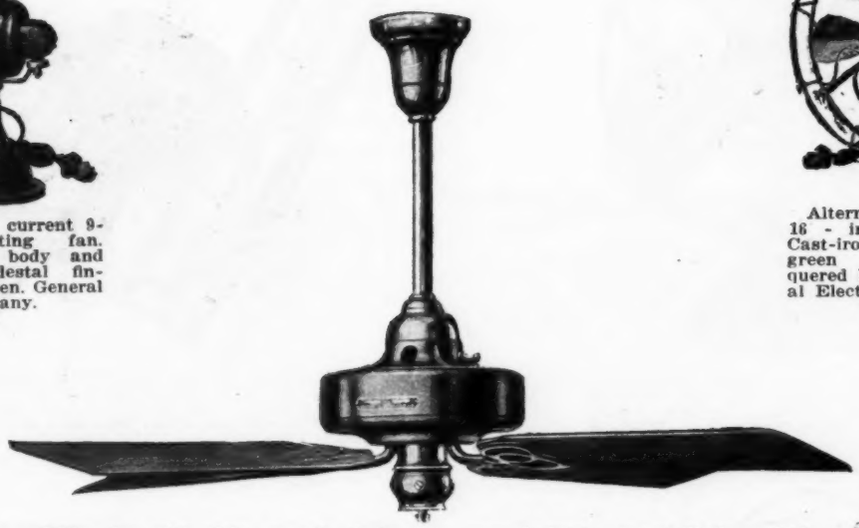
Direct-current 9-inch non-oscillating desk and bracket fan in wall position. Cast-iron frame finished in dark green. Lacquered brass blades. General Electric Company.

Direct-current 12-inch non-oscillating fan, changeable from desk to bracket position by turning one thumb screw. Cast-iron frame with dark-green finish. Blades of lacquered brass. General Electric Company, Schenectady, N. Y.

Alternating-current 16-inch non-oscillating fan in wall position. Dark-green iron frame. Lacquered blades designed for more uniform air flow throughout blast zone. General Electric Company.



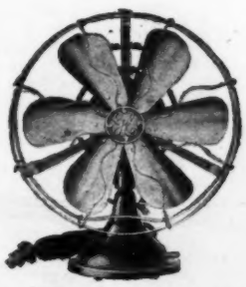
Alternating - current 9-inch oscillating fan. Drawn-metal body and cast-iron pedestal finished dark green. General Electric Company.



Ceiling fan with plain, smooth, dark-green enamel finish, except blades, which are mahogany finish. Made in 52 and 56-inch sizes, and direct-current and alternating-current types. Switch at bottom. General Electric Company, Schenectady, N. Y.

Alternating -current 16 - inch oscillator. Cast-iron frame. Dark green finish. Lacquered blades. General Electric Company.

Alternating-current 12-inch oscillating fan in bracket position. Dark-green cast-iron frame with handle at top. Brass lacquered blades. General Electric Company, Schenectady, N. Y.



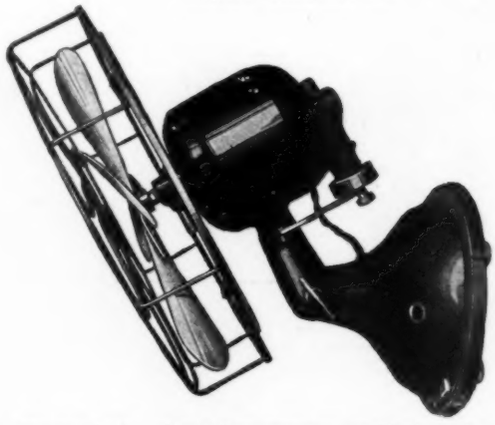
Six-blade 12-inch oscillator for alternating current only. Also made in 16-inch size. Runs lower speed than four-blade fans. Iron dark-green frame and brass blades. General Electric Company.

Six-blade 16-inch ventilating fan. Also made 12-inch size and with special bearings for vertical operation. Green enamel finish. General Electric Company.

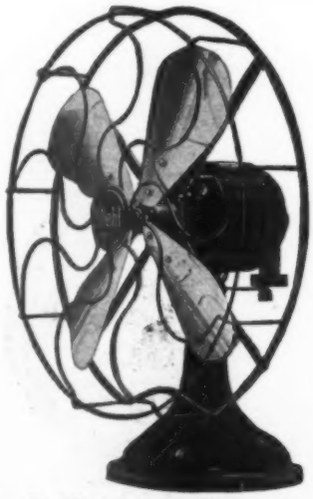
Western Electric alternating-current 56-inch ceiling fan. Die-cast body. Smooth and plain dull-black finish except blades. Also made with direct-current motor. Blades specially shaped for quiet operation. Western Electric Company, Inc., New York, N. Y.

Western Electric "Six." A small, light-weight, desk and wall fan. Die-cast body with dark-green finish. Made with different motors for direct current and alternating current. Western Electric Company, Inc.

Nine-inch direct-current and alternating-current desk and wall fan with die-cast body and dull-black finish. Also made in oscillating type. Western Electric Company, Inc., New York.

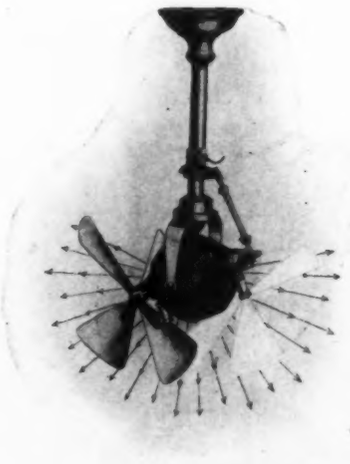


Twelve-inch alternating-current oscillating fan shown in wall mounting. Body is die-cast and finished dull black. Also made in direct current and in non-oscillating types; also in 16-inch sizes. Western Electric Company, Inc., New York, N. Y.



Diehl 16-inch oscillator. Oscillating mechanism improved for quiet and efficient operation. Also made in 9 and 12-inch sizes; the larger fans may be had with 4 or 6 blades. Diehl Manufacturing Company, Elizabeth, N. J.

Diehl ceiling fan. Direct-current model No. 44 with 56-inch blades. Black enamel finish. Diehl Manufacturing Company, Elizabeth, N. J.

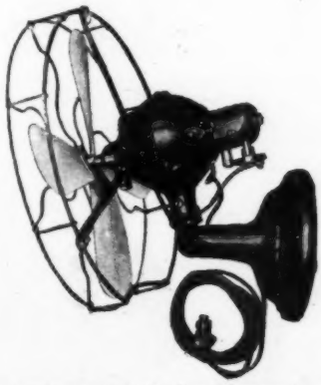


Boker self-rotating ceiling fan. Motor drives mechanism for rotating or gyrating the fan bodily about its stem support, thus securing with ceiling fan action somewhat similar to oscillating desk fan. H. Boker & Company, Inc., New York, N. Y.

Racine type No. 400 12-inch desk and bracket fan with universal motor. Black-enamel finish. Brass blades. Three speeds. Racine Universal Motor Company, Chicago, Ill.

Racine type No. 200 8-inch desk and bracket fan for direct-current and alternating-current circuits. Finished in black enamel and lacquered brass. Three speed adjustments. Racine Universal Motor Company, Chicago, Ill.

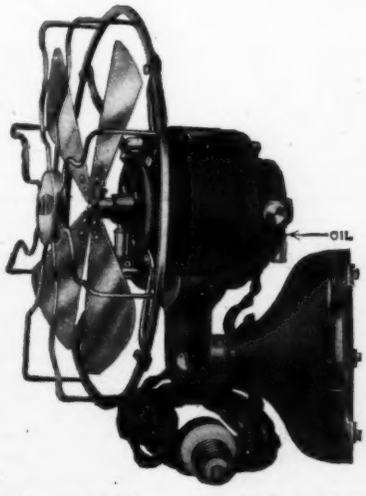
"Cyclone" 8-inch universal fan for direct and alternating current. Adjustable for five speeds. Extra heavy base. Polished nickel finish throughout. Hamilton-Beach Manufacturing Company, Racine, Wis.



Sprague 16-inch direct-current oscillator in wall position. Motor has single field coil. Enamel finish for motor body and guard. Lacquered brass blades. Also made in 12-inch size. Sprague Electric Works of General Electric Company, New York, N. Y.

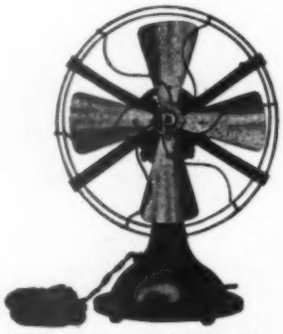
Sprague direct-current ceiling fan with 56-inch sweep. Body finished in black enamel. Blades have natural wood finish. Sprague Electric Works of General Electric Company, New York, N. Y.

Knapp 8-inch alternating-current single-speed fan. Black japan finish. Brass blades. Also made for direct-current circuits. Knapp Electric & Novelty Company, New York, N. Y.



Knapp 10-inch alternating-current fan in wall position. Black enamel and brass finish. Two speeds. Also made for direct current. Knapp Electric & Novelty Company, New York.

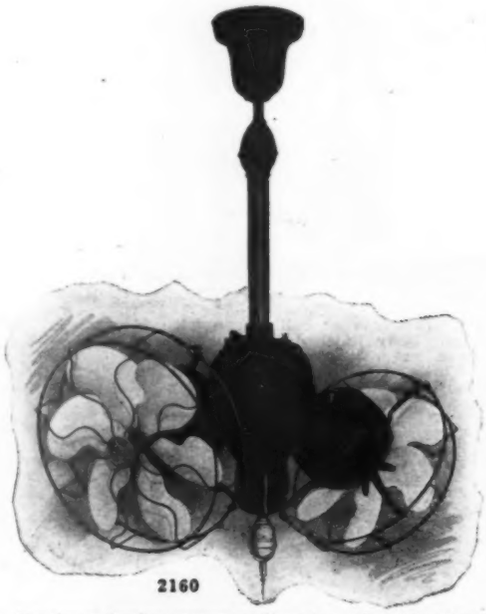
Knapp 8-inch battery fan. For use with 6-volt storage battery or 20 series-multiple-connected dry cells. Knapp Electric & Novelty Company.



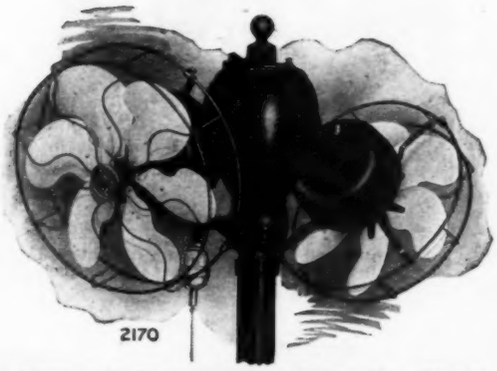
Pittsburgh "Eight Three"—an 8-inch, 3-speed desk and bracket fan with universal motor. Brass finish blades and black japan body. Shipping weight, 7 pounds. Pittsburgh Electric Specialties Company, New York, N. Y.

Pittsburgh "Six." Single-speed, 6-inch, desk and bracket fan. Universal motor. Black japan and brass. Shipping weight 4½ pounds. Pittsburgh Electric Specialties Company, New York.

Eck "Hurricane" alternating-current oscillator for desk or wall mounting. Special "———ming" blades. Three speeds. Made in 12 and 16-inch sizes. Black japan finish with polished brass blades. Eck Dynamo & Motor Company, Belleville, N. J.



Emerson duplex-rotary ceiling fan. Gyrating type with two 12-inch, 6-blade fans, each of which is adjustable as to angle. One motor is worm-geared to central member for providing the rotary movement. Adjustable pipe hanger. Steel ball bearings for all rotating parts. The Emerson Electric Manufacturing Company, St. Louis, Mo.



Emerson duplex-rotary floor-column fan. Similar to gyrating type of ceiling fan shown at left except column mounting. Also made with 16-inch, 4-blade fans and in direct-current and alternating-current types. Three-speed switch. Parker fan blades. Black enamel finish. Blades and switch polished brass. Emerson Electric Manufacturing Company.

Summary of Electric Fan Developments for 1918

From the illustrations on this and the foregoing pages it is evident that no very radical innovations have been made in fan designs for 1918. Aside from a few models that were in process of development before we became involved in the war, no new types are being marketed. War conditions with increased costs of materials and difficulties in obtaining necessary stocks of the same, combined with labor shortage in many manufacturing plants, have resulted in quite a few changes in fan construction, conservation being the idea back of nearly all of them.

Among these may be mentioned the following: Elimination of models for which the demand is very light and reduction in number of sizes listed; return to cast-iron motor casings and pedestals in some cases where drawn-metal frames had been used; use of steel instead of brass for blades and guards; reducing some models to single-speed type. These changes, together with elimination of dispensable refinements, make the present fan models no less useful than formerly, rather the opposite because utility is given more attention than ornament. Details in many cases have been improved. A green enamel is now used in several models, where black was formerly almost universal.

Trade Activities

Valuable Catalogs Distributed—Larger Quarters Obtained by Manufacturers—Central Electric Holds Sales Conference

Ajax Electric Company, recently incorporated in Jersey City, N. J., to manufacture electric generating machinery, has acquired property, about 99 by 100 feet, at Montgomery street and Baldwin avenue. It is said the structure will be used for manufacturing purposes.

Driver-Harris Company, Harrison, N. J., on the night of January 31 suffered a loss by fire of its insulated wire and electrical cord departments, causing the total destruction of these buildings. The production of resistance materials, castings, cold rolled strip, nickel sheet and other products is not interfered with and business continues as usual.

Crocker-Wheeler Company, manufacturer of electric motors and generators, alternating and direct current, with works and main office at Ampere, N. J., announces a change in its Cleveland (Ohio) office selling staff. Effective February 1 Messrs. Howard Dingle and W. W. Clark were succeeded by Messrs. Ben D. Christian and D. B. Graze, as representatives for the company, from the Cleveland office, Guardian Building.

Electrical Engineers' Equipment Company, Chicago, announces the removal of its general offices and a portion of its manufacturing departments to 710-714 West Madison Street. This new location is directly opposite the company's present quarters at 711-715 West Meridian Street. The major portion of the factory proper, together with the shipping and stock departments, will remain at this latter address, which is connected to the Madison Street building by means of a runway.

George J. Roberts Company, Dayton, Ohio, is distributing a four-page booklet, illustrating and describing Roberts "Gem" electric driven pumps. The pumps and systems described in the bulletin are guaranteed to supply any city, suburban or country home with water under pressure for bathroom, kitchen or laundry, irrigating lawn or garden, watering stock, and for all general purposes. The source of supply may be a shallow well or cistern, lake or stream, and the power for operating, any kind of electric current. Valuable pump data and net prices are contained in the bulletin.

Harvey Hubbell, Inc., Bridgeport, Conn., is sending out a perforated page, Bulletin 16-3, to fit its catalog, describing Hubbell flush receptacles. This receptacle is made with adjustable aliming plate and adjustable lugs. It is rated 6 amperes, 250 volts, and complies with the National Electrical Code standard. Several illustrations of the receptacle are shown and its use is said to be a decided benefit to the electrical contractor in a great saving of labor in the installation of flush plug receptacles, particularly in new building work, where the great majority of these devices are installed. It also gives satisfaction in the knowledge that the work, when using these receptacles has been properly done from a mechanical standpoint.

Standard Electric & Elevator Company, Inc., Baltimore, Md., has issued a prospectus in which a special offer affording an unusual and practical opportunity to investors is made. One hundred thousand dollars of 7 per cent accumulative preferred stock is offered for a limited period, and with each share a bonus of one-quarter share of non-assessable common stock will be given. The actual profit of the company, coupled with the growing demand for its products and service called for the reorganization with the provision for greater financial resources with which to take advantage of present and future business. The prospectus contains a brief biographical sketch of the personnel of the company and tells about its organization, service, and operating plan, and the efficiency of its sales organization. A somewhat detailed description of its various departments and the service rendered by them, equipment, shipping facilities, prospective business, together with other data is given in the booklet.

The Esterline Company, Indianapolis, Ind., announces the appointment of the F. R. Jennings Company, 616 Ford Building, Detroit, Mich., as its sales representative for graphic instruments for the state of Michigan. Mr. Jennings will handle the entire state of Michigan for The Esterline Company, with the exception of the northern peninsula, which is taken care of by the Milwaukee office.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing a number of pieces of new literature, among which is Catalog 8-E, illustrating, describing and diagraming its industrial heating apparatus. This catalog contains descriptions and illustrations of air heaters (these consist of the Bayonet and disc immersion types, steel-clad heaters and heaters for electric ovens), chocolate warmers, disc stoves, electrically heated ovens and enameling ovens, control equipment for enameling ovens, flanging bags, glue pots, hand-shells for hat manufacture, hot plates, solder pots, instrument sterilizers, disc and rectangular stoves, tailors' irons, and two pages are devoted to analyses of water heating and energy required for heating buildings. The company is also sending out a leaflet on automatic control equipment for railway substations. Several illustrations and descriptions of this practicable control equipment are given, which is designed to duplicate in every way manual operation of substation apparatus. With its compliments the company is distributing copies of President Wilson's address, delivered before the Sixty-fifth Congress last April, entitled "A Plea for Defense of Human Rights and Liberty."

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just issued Booklet T, containing eight pages, illustrating and describing the Thomas meter for the accurate commercial measurement of gases and air in large quantities, and should prove of great interest to those using gas in large quantities, such as steel mills, gas companies and others. The booklet gives the principle of operation, illustrates essential parts and shows typical installations. The Thomas meter is different from all other forms of gas meters, capable of measuring large quantities of gas, in that it gives the quantities in standard units by which gas is bought and sold and does not require any corrections for temperature or pressure. Further, it shows a totalized result on an integrating meter and a graphic record of the rate of flow on a curve drawing meter. The Thomas meter uses electricity as a means for measuring the quantity of gas, and is a desirable load for the electric light company because, under usual operating conditions, it will have a high load factor and practical unit power factor.

Penberthy Injector Company, Detroit, Mich., is distributing its Catalog No. 28, which describes and illustrates Penberthy products. This artistic booklet is divided into five sections, the first of which treats the Penberthy automatic injector, giving dimensions for installation, table of capacities, information about connections, repairs, price lists on screw and flanged connections and repairs, low pressure, high pressure and hot water injectors, etc.; also illustrates and describes auto-positive injectors and XL-96 ejectors, hydraulic and lifting ejectors, submerged spray rig tank filler, automatic and non-automatic cellar drainers, hydraulic pump, etc. Section 2 takes up Penberthy regrinding brass valves and accessories. Section 3, dealing with oil and grease cups, describes and illustrates the Sentry, Sure-Drop, Slide Top, Sancho, Screw Top, IXL, and Safety Improved oil cups, and the Samson, Silex, Saturn, Senator and Siren grease cups and hand oil pumps. Section 4 treats water gages, including various types of the Penberthy and the Safeguard. The last section, No. 5, takes up miscellaneous products, including noiseless water heaters, driftless air cocks (valve design), leakless priming cups, and a table of weights for Penberthy products. A telegraph code is conveniently given on the last page of the catalog.

Merchants Light & Heat Company, of Indianapolis, Ind., has been awarded a contract by the board of commissioners of Marion County, Indiana, for supplying light and heat to the various county buildings for 1918. The contract amounts to $13,440 and provides that the commissioners may have the right to terminate the heat from the company May 25, with an allowance of three-eighths of the heating charge.

Electric Sales Corporation, 147 Henry building, Seattle, Wash., has secured the exclusive rights for the manufacture and sale of the Lindberg electric moisture vaporizer for eliminating trouble and "freezing" of pneumatic tools, such as riveting machines, pneumatic drills, etc. It has been estimated by one of the largest shipyards in the city that the installation of the Lindberg vaporizer will effect a saving of $32,000 a year among the riveting gangs alone.

Gilpin V. C. Company, broker in electrical merchandise, formerly located at 2010 Broadway, New York City, has removed its offices to its warehouse at 50 Columbia Heights, Brooklyn, N. Y. A complete stock of products of the Triangle Conduit Company, and a line of conduit fittings and tools of the M. B. Austin Company, will be carried, also the Trico renewable type fuse, which has lately been approved by the National Board of Fire Underwriters.

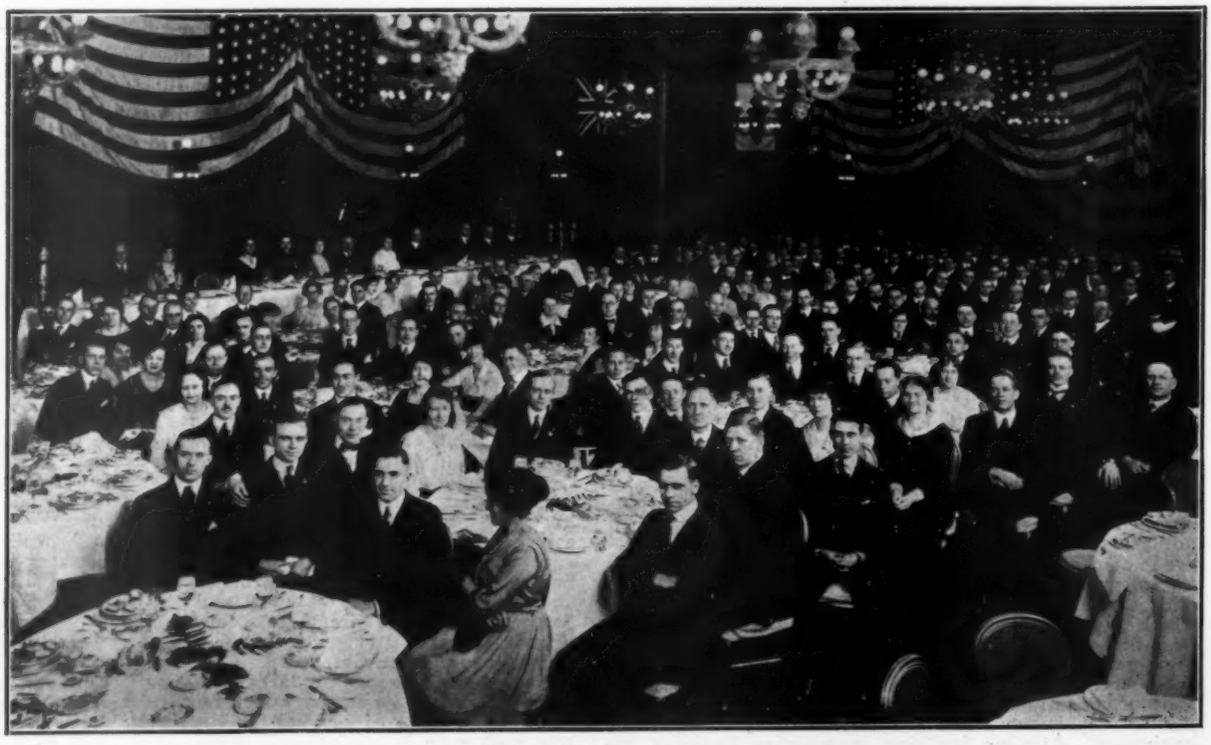
Walter A. Zelnicker Supply Company, of St. Louis, Mo., has established permanent offices at 627 Plymouth building, Minneapolis, Minn., to serve the North Central and Canadian trade. The offices will be in charge of Richard K. Papin, who for ten years was manager of the equipment department of the Zelnicker company. Mr. Papin was formerly connected with the Davenport Locomotive Works at St. Louis and southwestern representative and is well qualified to handle inquiries on rails, locomotives, cars, machinery, etc., in his district.

Central Electric Company, Chicago, recently held its sales conference, following the close of which the annual banquet took place, attended by 208 of the nearly 400 employes of that company. The gathering included all salesmen and members of the sales and quotation departments and the older members of the concern. The usual custom of limiting the dinner to men only was departed from and ladies of the organization were also invited by the management. The decision proved to be a happy one and the occasion was announced a complete success.

Cheatham Electric Switching Device Company, of Louisville, Ky., which recently filed articles of incorporation, listing a capital stock of $60,000, is planning to enlarge its business, which was established in Louisville several years ago. This concern manufactures electrically-operated switches for steam and electric lines. The incorporators are J. S. Stewart, R. V. Cheatham, and J. D. Augustus.

National Lamp Works of the General Electric Company, through its Engineering Department, presents a bulletin, entitled "Fundamentals of Illumination Design," which discusses in a simple and comprehensible manner the broad principles which underlie illuminating engineering practice. The bulletin is one which should prove of exceptional value to schools and colleges, particularly to those in which a course in illumination is included as a part of the regular course of study. Its value is not limited to students, however, for much of the material presented is the result of very recent investigations, and the data will bear the closest scrutiny of the practicing illuminating engineer. This publication dealing with the fundamentals and the bulletins on specific applications, such as Industrial Lighting, Store Lighting, etc., together with the bulletins on Mazda lamps, comprises an accurate, practical, and up-to-the-minute reference work on illumination.

Robbins & Myers Company, Springfield, Ohio, is distributing a circular descriptive of advertising matter which will be furnished to dealers of R. & M. fans. This circular gives a striking window display, 20x40 inches in size, of a cut-out design and printed in eight colors on a heavy board. Six electrotypes and copy for newspaper advertising are shown, three of which, as well as the four lantern slides illustrated, are of a humorous cartoon style giving quotations by Walt Mason, the well known and popular writer whose rhymes appear in daily papers all over the country, and tell the story of fan comfort in a most effective manner. Booklets 1116 and 1117 are also offered for distribution. Booklet 1116, entitled "The Summer Solace," in a very interesting way tells of the many advantages of fan comfort and is bound to create new business for distributors of this R. & M. product. Booklet 1117 is a complete catalog of R. & M. fans, giving a detailed description of the fans and such information as speeds, watts, weights, etc. All of the above mentioned material is furnished free and merits the attention of any dealer desirous of increasing the sale of fans backed by the reliability and guarantee of the Robbins & Myers Company.



Banquet of Sales Division Employes of Central Electric Company.

Men in Service

General Squier Directs Service in Signal Corps—Irving Folks Receives Commission—G. C. Pratt Promoted

H. D. LYON, sales engineer of the Chicago office of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has enlisted in the aviation service.

W. M. GOODRICH, who for some time has been Chicago correspondent of the Western Electric News, has enlisted in the Aviation Corps. He was one of five men selected out of a group of 36 candidates.

ROSE POLYTECHNIC INSTITUTE in its December-January issue of Rose Technic publishes its roll of honor, bearing the names, rank and addresses of 138 men, who are graduates, undergraduates or ex-students of that institution.

GEORGE C. PRATT, secretary of the Western Electric Company, has been promoted from lieutenant to captain. The advance in rank will not take Captain Pratt away from Company A, of the 219th Field Signal Battalion (New York Radio Company) and he will remain in command of that Western Electric division, which is still located at Camp Sherman, Chillicothe, Ohio.

W. H. MIKKELSON, who was formerly connected with the general purchasing department of the Western Electric Company at New York, has been appointed assistant head storeman at the Portsmouth, Va., navy yard, and has charge of all the supply buildings with the exception of three, which are used for supplies which are out of his line.

LIEUTENANT IRVING FOLKS, formerly of the Foreign Sales Department of the Western Electric Company, recently received a commission as second lieutenant of Infantry in the regular Army. Lieutenant Folks attended the first Plattsburg camp, beginning in May, 1917, at the end of which he was recommended for further training at the second Plattsburg camp, which began in August, and at the termination of this camp received his commission as lieutenant.

PACIFIC GAS & ELECTRIC COMPANY, with general offices at San Francisco, Cal., lists the names of 362 employees in its monthly publication who have been called to the colors. The enlistments from the various districts are as follows: San Francisco, general offices, 42; departments, 96; supply district, 6; Alameda County, 54; Chico, 1; Colgate, 6; Contra Costa, 8; Colusa, 1; De Sabla, 5; Drum, 5; Electra, 5; Fresno, 5; Marin, 8; Marysville, 16; Napa, 4; Nevada, 3; Petaluma, 1; Placer, 5; Redwood, 21; Sacramento, 32; San Joaquim, 4; San Jose, 28; Solano, 3; Santa Rosa, 2; Vallejo, 1. The following employees have enlisted but have not as yet been called: Charles C. Jensen, Alfred L. McGuffin, Frank W. Thunberg, Joseph Hefner, James M. Mayfield, William N. Lindblad, Hayward C. McDonald, Joseph Bearwald, Cornelius T. Shea, Milton J. Durand, William T. Martin, Walter R. Thilkie and R. G. Hanson.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

MAJOR-GENERAL GEORGE O. SQUIER, well known to electrical men for his important achievements in telephony and telegraphy, is at the head of the Signal Corps, one of the most important branches of the United States Army. In this capacity General Squier has charge of all of the usual telephone

Major-General George O. Squier.

and radio signaling services formerly performed by the Signal Corps as well as the very important aviation work. General Squier was born in Dryden, Mich., in 1865. He entered West Point military academy in 1883 and was graduated four years later with the rank of Second Lieutenant. During the Spanish-American War he rendered valuable services in the Signal Corps. In 1900 he took the cable steamer Burnside from New York through the Suez Canal to the Philippine Islands, where he laid the inter-island cable, which is still in use. In March, 1903, he was made a Major. In 1907, while chief of staff to General Allen of the Signal Corps, he drew up first specifications for military airplanes and on September 12, 1908, he made the first ascent as a passenger in an airplane in the famous demonstration trials of the Wright Brothers. In 1912 he was sent to England as military attache to the American Embassy, and was abroad when the European war broke out so that he was a close observer of the military campaigns of the first two years of the war. In May, 1916, he was recalled by President Wilson to reorganize the air service and on February 4, 1917, was made chief signal officer in charge of both the aviation and signal corps with rank of Brigadier-General, and on October 6, 1917, he became Major-General. Aside from the very important duties that General Squier has under his charge, involving the expenditure of over $700,000,000 for aviation alone, he has coordinated all of the activities connected with the various branches of the signal service. General Squier is well known among electrical men for the famous paper entitled "Multiplex Telephony and Telegraphy by Means of Electric Waves Guided by Wire," presented before the 1911 convention of the American Institute of Electrical Engineers. In the following year he was awarded the Elliott Creson gold medal of the Franklin Institute for this research work in multiplex signalling.

SOUTHWESTERN TELEPHONE COMPANY now displays a service flag, which contains 467 stars representing that number of its employees who have answered the call to the colors.

ROBERT M. CRUTCHFIELD of the industrial engineering department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has assumed his duties as first class electrician in the United States Navy.

COMMONWEALTH EDISON COMPANY may well be numbered among those who are doing their "bit" to win the war in that 620 men have been taken from its ranks for Government service. The company takes great pride in this fact, which is indicated by the display of two electric signs in shop windows in honor of its enlisted employees.

THE MINING & METALLURGICAL SOCIETY OF AMERICA in a recent issue of its bulletin devotes several pages to its roll of honor. Thirty-six members of the organization have been called into the service of the United States and allied armies, a number of whom are prominent in the nation's war program, among whom is Herbert Hoover, United States Food Administrator.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS now displays a service flag containing 700 stars, representing that number of its members enlisted in the Nation's service. The society in the February issue of its Journal publishes the eighth installment of its roll of honor.

Personal

J. H. Pardee and J. P. Ripley Back From Philippines—John F. Gilchrist President Federal Sign System—Other Changes

EDWIN A. MOORE has severed his connections with the Union Switch & Signal Company, Swissvale, Pa., as works manager, and has assumed the duties of manager of the Liberty Ordnance Company, Bridgeport, Conn.

J. P. BALOUN, chief of the drafting department of the Pacific Gas & Electric Company, San Francisco, Cal., has left the company to accept a position with the Pacific Coast Ship Building Company.

ROY CRANDALL, publicity agent for the Buffalo General Electric Company, Buffalo, N. Y., was recently appointed advertising agent for the International Railway, Buffalo, a new position created by E. G. Connette, president of the company.

G. A. DE HASETH, who in former years was associated with the Tacoma Railway & Power Company, has become manager of the Ponce Electric Company, Ponce, P. I., and succeeds P. M. Hatch, who enlisted in the Ordnance Department of the army.

GEORGE W. STRACK, JR., who for the last four years has been connected with the Middle West Public Utilities Company, Chicago, Ill., as a member of the bureau of safety, has become associated with the Central Illinois Public Service Company as safety agent.

THOMAS A. EDISON, the inventor, was 71 years old February 11. There was no celebration of the event at Menlo Park, N. J., the Edison home, because the great inventor was too busy on his work for the United States Government to spend the day in idleness.

T. R. STEINGOETAGER, who has been in the employ of the St. Clair Gas & Electric Company, with headquarters at Belleville, Ill., for many years, has been appointed business manager of that concern. In late years he has served the company as traveling auditor and has more recently been general auditor at the East St. Louis, Ill., office.

JAMES B. OLSON has severed his connections with the Habirshaw Electric Cable Company, Inc., as assistant secretary and general sales manager. It is the intention of Mr. Olson to continue in the insulated wire and cable business and definite announcement of this will be made by him in the near future. In the meantime he will be located at Hotel Chatelaine, Bedford avenue, Brooklyn, N. Y.

DONALD MCDONALD, vice-president and general manager of the Louisville Gas & Electric Company, Louisville, Ky., was recently elected vice-president of the Louisville Industrial Foundation. This organization, which has a million-dollar factory fund, was promoted by the Louisville Board of Trade to bring new industries to the city and aid in retaining old ones. Financial aid has been let to several concerns by the organization, which has had a very successful year.

M. L. KILBOURNE, branch manager of the Shipowners' Radio Service, San Francisco, Cal., has been appointed division superintendent of the Seattle office of that company.

FRANKLIN T. GRIFFITH, president of the Portland Railway, Light & Power Company, Portland, Ore., has been appointed state director of the United States Public Service Reserve.

L. H. THULLEN, formerly connected with the Hall Switch & Signal Company, New York, has assumed the duties of general manager of the Grand Rapids Brass Company, Grand Rapids, Mich.

FRED WILMARTH, Rockford, Ill., has been selected to represent the Greusel-Quanfot Electric Company of Milwaukee, Wis., in northern Illinois and southern Wisconsin. Mr. Wilmarth has just completed a long service with the firm of E. F. Pendergast & Company of Rockford.

NELSON P. HALL has assumed his duties as district sales manager for Chicago territory of the Van Dorn & Dutton Company, gear specialists of Cleveland, Ohio. Mr. Hall will locate his office at 14 East Jackson Blvd., and will look after the gear and pinion requirements of electric railways and mines in the Chicago district.

J. H. PARDEE, president of the J. G. White Management Corporation, New York City, and J. P. Ripley, engineer, have returned to New York from a general inspection tour of the Manila Electric Railroad & Light Company, and other interests in the Philippine Islands operated by the J. G. White Management Corporation.

C. B. COOPER, general superintendent of the Shipowners' Radio Service, a subsidiary corporation of the Kilbourne & Clark Manufacturing Company, Seattle, Wash., manufacturer of wireless apparatus, has been appointed manager of the New York office of the Kilbourne & Clark company. He will retain the old position in connection with his new appointment.

JOHN F. GILCHRIST has been elected president of the Federal Sign System (Electric), succeeding John H. Goehst who died on January 1, 1918. Mr. Gilchrist was one of the organizers of the Federal Electric Company, the predecessor of the Federal Sign System (Electric) and served the company as treasurer for a number of years. Mr. Gilchrist is also vice-president of the Commonwealth Edison Company, vice-president of the Middle West Utilities Company, and assistant to the president of the Public Service Company of Northern Illinois. He was president of the National Electric Association in 1911-1912 and was president of the Electric Vehicle Association of America in 1914-1915. Mr. Gilchrist is one of the best known utility men in the Central West.

JAMES M. GILCHRIST has been elected secretary and treasurer of the Federal Sign System (Electric) to succeed John F. Gilchrist, who has been elected president of the company, following the death of John H. Goehst.

SYDNEY L. WRIGHT, president of the New Jersey & Pennsylvania Traction Company, Trenton, N. J., which controls the Trenton, Lawrenceville & Princeton Railroad, was recently appointed president of the company, succeeding W. R. Wright.

MILTON RUPERT has been appointed vice-president and assistant treasurer of the R. D. Nuttall Company, Pittsburgh, Pa., manufacturers of gears, pinions and trolleys. Mr. Rupert will have charge of sales and manufacturing activities of the company.

W. L. BARKER has resigned as electrical engineer of the Southern Utilities Company, with electric, gas and ice properties in Florida, to become electrical engineer of the Manila Electric Railroad & Light Company, Manila, P. I., both of which concerns are under the management of the J. F. White Management Corporation of New York City. Previous to his connection with the Southern Utilities Company, Mr. Barker was associated with the staff of the General Electric Company.

S. M. GREER has resigned as general commercial superintendent of the Chesapeake & Potomac Telephone Company to accept the vice-presidency of the Bankers Trust Company, New York City. Mr. Greer, who has been connected with Bell telephone interests for 28 years, has made a brilliant record and has been steadily promoted since entering the field. During the last seven months he has devoted much of his time and attention to a volunteer position with the Red Cross at the capital and it is understood that his connection with the New York banking institution will not interfere for the present with these duties.

OBITUARY.

GEORGE C. PENBOSS, electrical engineer and manager of the New York establishment of the United & Globe Rubber Manufacturing Company, died on February 4, at St. Luke's Hospital, New York.

JAMES CUMMINGS VAIL, of Morristown, N. J., who prior to his retirement six years ago was associated with his cousin, Theodore N. Vail, president of the American Telephone & Telegraph Company, died February 2, at Miami, Fla., aged 74 years.

FRANK CURTISS, president of the Sixth Avenue Surface Railway, and one of New York's oldest railroad men, died on February 4, at his home, 46 West Fortieth street, New York, of pneumonia, after an illness of ten days. Mr. Curtiss was 79 years of age.

Recent Patents

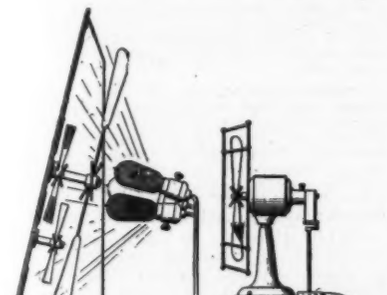
Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Machine-Switching Telephone System (1,250,579).—Instead of compelling the calling party to negotiate through the operator again in case the called party hangs up his receiver too early, Charles L. Goodrum, of Brooklyn, N. Y., provides a system whereby the calling party may himself ring the bell at the other end of the line. This patent is assigned to the Western Electric Co.

Electric Broiler (1,251,232).—Miniature andirons have been provided in a patent to Charles E. Hubbard, of New Decatur, Ala., who uses prongs on opposed pairs of shelves for holding the meat, and slopes these shelves to drain off the spattered juice.

Illuminated Sign (1,251,283).—Instead of using a motor-operated flasher, George R. Pyper (of Midvale, Utah) operates his sign-changing flasher by air-driven blades, and uses



No. 1,251,283.—Illuminated Sign.

an ordinary fan motor for creating the needed blast of air.

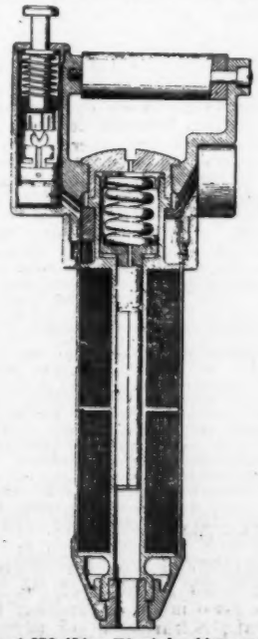
Time Switch for X-Ray Machines (1,250,729).—With Roentgen apparatus, it usually strains the tube less to make a series of short exposures, than to make a single long one of the same aggregate of time. But, in thus subdividing the time required for the desired exposure, the operator is apt to become confused and either under-expose the film or overstrain the tube. To help him out, Harry F. Waite, of Whitestone Landing, N. Y., has designed a switch which enables the operator to close the circuit as often as he desires, but only for the aggregate length of time for which the apparatus was adjusted.

Variable-Speed Motor (1,250,719).—This patent, issued on an application filed more than five years ago, appears broadly to cover the idea of using a ring-wound armature with both external and internal field poles, and of having one set of the field poles reversible in polarity. Assigned by Wm. A. Turbayne, of Niagara Falls, N. Y., to the U. S. Light & Heat Corporation, of the same city.

Semi-Automatic Telephone System (1,250,583).—For semi-automatic systems, Henry J. Herink, of London, England (according to a patent assigned to the Relay Automatic Telephone Co., of London) provides a system which enables the operator to control the trunk and operate the subscriber's meter, even if the subscriber has replaced his receiver.

Aluminum Lightning-Arrester (1,250,286).—Instead of using separate plates or disks and connecting these by auxiliary means, John Coulson (of Wilkensburg, Pa., in a patent assigned to the Westinghouse Electric & Mfg. Co.) shows only two sheets of aluminum, each bent into a series of folds with the alternate folds of one sheet extending inside the folds of the other.

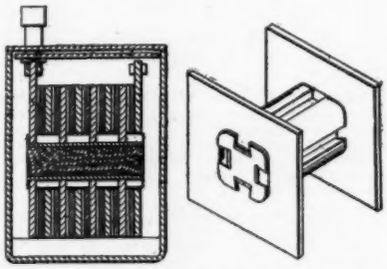
Electric Hammer (1,250,401).—Low cost of manufacture, and safety against a loosening of the parts by vibration, were among the aims of Alex Wendelburg, according to the patent assigned to the Pittsburgh Electric Tool Co. The main portion of the tool can be safely immersed in water to cool it, so that a convenient bucket of water obviates the need of an elaborate water-cooling system.



No. 1,250,401.—Electric Hammer.

Electrolytic Apparatus (1,250,141).—A simple arrangement for firmly holding the active plates of lightning arresters, electrolytic condensers and rectifiers in properly spaced relation is shown in this patent, assigned by Lewis W. Chubb, of Edgewood Park, Pa., to the Westinghouse Electric & Mfg. Co. He uses horizontal plates of film-forming material and interposes spacers also composed wholly of film-forming material.

Storage-Battery Cell (1,250,696).—Unusual means for supporting storage-battery plates and for preventing



No. 1,250,696.—Storage-Battery Construction.

them from buckling are provided by Edward E. Stout, of Indianapolis. He perforates each plate and mounts them all on a spool which carries contact strips for making electrical connections.

Electric Primer (1,250,465).—An electric heating coil placed inside the inlet manifold of a carbureting apparatus forms part of the device designed by Charles D. Jenney (of Indianapolis) for starting an internal-combustion engine under adverse conditions, and for enriching the explosive mixture at other times. The patent was assigned to the National Automobile Equipment Co., also of Indianapolis.

Condenser Switch (1,251,440).—By a simple system of circuits, Morton Sultzer, of Brooklyn, (in a patent assigned to the Western Electric Co.) obtains condenser combinations advancing by unit steps, although the condensers used are not of uniformly increasing capacities. For example, with condensers having relative values of 1, 2, 3 and 6, his switch instantaneously affords the connections in parallel by unit steps from zero to ten.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

NORWICH, CONN.—At a special election an appropriation of $200,000 for the installation of a 3,000 kilowatt turbine and two 500 horsepower boilers in the municipal electric light plant was authorized.

BUFFALO, N. Y.—The City Council is having estimates prepared of the cost of securing turbines and other power plant equipment for installation in a proposed municipal electric lighting plant.

BUFFALO, N. Y.—The City Council is planning for the installation of considerable new equipment in its power plant to provide for the development of 4400 cubic second feet of water from the Niagara River.

BROOKLYN, N. Y.—Kings County Electric Light & Power Company, 360 Pearl street, has recently made application to the Public Service Commission for permission to issue bonds for $1,000,000, to provide for extensions, improvements, etc.

BUFFALO, N. Y.—Niagara, Lockport & Ontario Power Company, which recently took over the Salmon River Power Company, has been granted approval by the Public Service Commission on its application to issue $1,300,000 two-year six per cent convertible gold notes for improvements now under way at one of its power plants and to meet outstanding debts. The notes are being offered at 97 and interest, to yield approximately 7.65 per cent.

LONG ISLAND CITY, N. Y.—New Amsterdam Gas Company, Vernon avenue, has filed plans for the construction of a two-story steel plant, about 45x75 feet, to be located on Freeman avenue, near Vernon avenue. The structure is estimated to cost about $10,000.

LONG ISLAND CITY, N. Y.—Astoria Light, Heat & Power Company, Shore Road, has had plans prepared for the construction of a plant, about 45x175 feet, on Winthrop avenue, near Barclay street. Estimated cost of the new works is $20,000.

NEW YORK, N. Y.—Ernest & Herman Levy, Fourth avenue and Nineteenth street, are planning for the construction of a power house and silk mill on Purdy and O'Dell streets, the entire work being estimated to cost $75,000. Frederick A. Phelps, 920 Union Building, Newark, N. J., is the architect.

NEW YORK, N. Y.—Andes Exploration & Smelting Corporation, 68 William street, has filed notice of a change in its corporate name to the Andes Electric Corporation.

NEW YORK, N. Y.—Dorrite Insulation Company, manufacturer of insulation specialties, has filed notice with the Public Service Commission of an increase in its capitalization from $200,000 to $300,0000 to provide for expansion.

ONEIDA, N. Y.—Attached to all monthly statements of the Adirondack Electric Power Company, are notices issued by the Public Service Commision appealing to consumers to conserve electricity and gas to all possible extent. Users of electricity are especially urged to discontinue the use of the old-fashioned carbon lights, which consume a great amount of electricity, and to substitute the modern globes, while gas consumers are asked to conserve in every possible way, including the substitution of mantle burners for the open flame burners.

ROCKVILLE CENTRE, L. I.—The shortage of fuel is being seriously felt at the local municipal power plant, and it has become necessary to borrow a large amount of coal from the Knickerbocker Ice Company to supply the needs until relief is in sight.

CAMDEN, N. J.—City officials are considering the construction of a municipal electric lighting plant.

ELIZABETH, N. J.—Elizabethtown Gas Company has recently issued notification to the Board of Works that an increase of $2.00 per lamp per year for the next three years would be effective, making the cost of street lighting $29,000 annually.

IRVINGTON, N. J.—The Board of Commissioners has approved an appropriation of $15,000, as requisitioned for in its annual budget for 1917, to be used for electric street lighting purposes.

KEYPORT, N. J.—Jersey Central Traction Company is making rapid progress in the work of improvements in its power house, and it is expected that it will be completed within the next few days.

MILLBURN, N. J.—In its annual budget for 1918, the Town Committee has approved an appropriation of $6,750 to be used for electric street lighting purposes.

NEWARK, N. J.—Butterworth-Judson Corporation, Avenue R, has had plans prepared for the construction of a one-story addition to its power plant, about 55x110 feet, to cost $25,000.

NEWARK, N. J.—Gamon Meter Company, 286 South street, has taken out a building permit for the construction of a one-story brick power house addition to its plant. Contract for erection has been awarded to William L. Blanchard, Newark.

NEWARK, N. J.—General Lead Batteries Company, 4 Lister avenue, has had plans prepared for the construction of a one-story addition, about 55x80 feet in size, to its plant. The company has taken out a building permit for the structure.

NEWARK, N. J.—Due to the shortage of coal, the Public Service Electric Company was compelled to suspend all electric service, effective February 2, until February 5, with the exception of certain concerns exempted from the Monday shut-down.

TRENTON, N. J.—The city has recently secured several new electrical devices to be used in connection with the thawing out of frozen water pipes, and all experiments made to date have proved thoroughly satisfactory. At the present time there are more requests on file with the City Commission than can be handled.

TRENTON, N. J.—The city will expend $100,000 for the installation of new pumping machinery and generators. Address J. R. Fell, city engineer.

DERRY, PA.—Fire recently damaged to a considerable extent the plant of the Pittsburgh High Voltage Insulator Company, manufacturer of insulator specialties. This is one of the four plants in the country engaged in the manufacture of high tension insulators.

HARRISBURG, PA.—Coal shortage at the plant of the Harrisburg Light & Power Company may cause a temporary shutdown with the consequent suspension of power service to all the large industries in this vicinity, unless arrangements are made by the National Fuel Administration for relief. Eight cars of bituminous coal have already been commandeered for the plant by county fuel administrator Ross A. Hickok, but this is, necessarily, relief of a temporary nature.

HARRISBURG, PA.—Harrisburg Railways Company is planning for the immediate installation of three large new transformers in its substation, to provide for the utilization of power from its York Haven plant through the plant of the Harrisburg Light & Power Company to increase the power at the railways station. It is planned to use the current from the substation for the operation of the Second, Third and Fourth street traction lines. Frank B. Musser is president.

HARRISBURG, PA.—Juniata Public Service Company, which recently took over a number of electric companies in the Susquehanna and Juniata Valleys, has filed notice with the Public Service Commission of a bond issue of $300,000.

PHILADELPHIA, PA.—Bell Telephone Company has recently filed plans and awarded contract for the proposed alterations and improvements in its telephone building at Eleventh and Filbert streets. Albert Zellfelder, Philadelphia, is the contractor.

READING, PA. — Metropolitan Edison Company has filed notice with the Public Service Commission of the issuance of bonds for $51,000 to provide for extensions, etc.

DOVER, DEL.—Diamond State Telephone Company has had plans prepared for the construction of an addition to its plant, and alterations in section of the works.

WASHINGTON, D. C.—United States Government, Bureau of Yards & Docks, has awarded a contract to the Penn Seaboard Steel Corporation, Franklin Building, Philadelphia, Pa., for the installation of a new 3000-kilowatt turbo generator at the local navy yards, at a cost of $56,385.

WASHINGTON, D. C.—The United States Government, Navy Department, is now erecting in France a large radio station to afford direct communication between Washington and American Army Headquarters. The station will be taken over by the French government after the close of the war. It is estimated that the station will cost $2,250,000.

CHARLESTON, W. VA.—The State University is planning for the reconstruction of its boiler house recently destroyed by fire.

WHEELING, W. VA.—Fire, on February 4, destroyed the car barns and a portion of the rolling stock of the Wheeling Traction Company, located on Wheeling Island, with a loss estimated at $200,000.

JOHNSTON, S. C.—Boyd Utilities Plant, of which F. M. Boyd is manager, has purchased and will operate the electric light and ice plant of the Carolina Public Service Company.

COCHRAN, GA.—The city is planning to make alterations and improvements in its electric lighting plant to cost about $5,000. C. W. Davis is superintendent.

CORNELIA, GA. — Wofford Shoals Light & Power Company is considering extensions in its transmission system to Lulu, Ga. The company has recently been awarded a contract for furnishing electric service for the operation of the street lighting system in Clarksville.

JEFFERSONVILLE, GA.—A resolution providing for election upon issuance of $15,000 of municipal bonds for establishing electric plant and water works system is being prepared by the city attorney. Address W. Hopson Goodloe, engineer, Macon, Ga., or A. K. Smith, city clerk.

POWDER SPRINGS, GA.—Application for the incorporation of the Domestic Electric Company to operate an electric light and power plant has been made. The concern is capitalized at $2500. Address J. D. Middlebrooks and J. A. Lewis.

VALDOSTA, GA.—A. G. Langford contemplates establishing a hydroelectric plant at Willacoochee River.

ST. PETERSBURG, FLA.—St. Petersburg Lighting Company is planning to increase the capacity of its electric lighting plant, and will make improvements to cost about $40,000.

NORTH CENTRAL STATES.

CINCINNATI, OHIO. — Kelley Koett X-Ray Company will purchase transformers, coils and X-Ray manufacturing machinery. The company will spend $2,500 to $3,300 for such new equipment. Address J. R. Kelley, Kelley Koett X-Ray Company, Cincinnati, Ohio.

CLEVELAND, OHIO.—Cleveland Railway Company has filed application with the Ohio public utilities for permission to issue $2,700,000 common stock. About $1,500,000 of this amount will be used for new cars and other equipment and improvements and the balance will be refunded to floating indebtedness. Address general manager.

COLUMBUS, OHIO.—Columbus Railway, Power & Light Company will purchase new equipment, such as street cars, electric equipment, etc., to be used in the new power plant. These improvements will be made at a cost of $175,000.

DAYTON, OHIO.—Dayton Power & Light Company will furnish electric power for construction purposes at the Huffman Hill, Taylorsville, Germantown and Englewood dams. The power will be furnished to the Miami conservancy. The Dayton power plant will be in need of new electrical equipment, etc., to be used in this contract. The construction work will involve the expenditure of about $30,000.

ALTON, ILL.—Alton Gas and Electric Company has filed a new set of rates with the Illinois Public Utilities Commission.

EAST ST. LOUIS, ILL.—The East St. Louis Light & Power Company has filed a petition with the Illinois Public Utilities Commission asking for a new schedule of rates for lighting windows and electric signs.

MATTOON, ILL.—The Illinois Public Utilities Commission has suspended until June 1, 1918, a proposed increase in lighting and heating rates of the Central Illinois Utilities Company, affecting twenty-seven towns.

AMHERST, WIS.—Amherst Electric Service Company contemplates the establishment of an electric light plant.

APPLETON, WIS.—A site has been purchased by the Patton Paper Company on which it is planned to erect a hydroelectric power plant. John McNaughton is president of the company.

BLOOMER, WIS.—At a recent election it was voted to buy the plant of the Bloomer Electric Light & Power Company. It is understood that the appraisement will be made this month.

JANESVILLE, WIS.—Janesville Electric Company has under consideration the erection of an addition to its power plant.

POYNETTE, WIS.—The electric light plant which has been owned and operated by Perry Speed was recently sold to L. M. Libby, Glenwood, Wis. Mr. Libby will take possession of the plant at once.

LANESBORO, MINN.—Plans for the erection of a hydroelectric plant have been made by the consulting engineer of the Power Engineering Company, Minneapolis. The city will build a superstructure for the power house and will receive bids on water wheel, generator and governor. Address H. T. Asks, city clerk.

MARION, IOWA.—Iowa Railway & Light Company with its February electric bills has sent its customers notice that the electric light rates for the coming month will be 10 per cent higher. It is stated that this step was necessary on account of the high cost of coal, labor and supplies.

WINTERSET, IOWA. — Improvements will be made to the municipal electric light plant, including the installation of a 150 horsepower boiler and the erection of a smokestack 125 feet in height.

KANSAS CITY, MO.—Whitewater Power & Mining Company has been organized with a capital of $500,000 with A. F. Adams as president, and W. R. Hemphill as secretary.

KANSAS CITY, MO.—W. C. Scarritt, attorney for the Interurban Central Station Company, has deposited the Commerce Trust Company's treasurer's check for $10,000 with Eugene H. Blake, city comptroller, as evidence of good faith that the new interurban station would be built. The company has until March 8 to file a bond of $50,000, to be approved by the city comptroller, when it can withdraw its check. The new station will be built on McGee street, between Ninth and Tenth streets.

ST. JOSEPH, MO.—Improvements to cost $31,000, providing power for an ornamental lighting system are contemplated by the city.

DOWNER, KANS.—United Telephone Company will erect a building to cost approximately $15,000. Address C. S. Brown, general manager, Abilene.

NESS CITY, KANS.—The installation of a new 100 horsepower Snow oil engine in the municipal electric light plant is under consideration.

FALLS CITY, NEB.—A bond issue of $60,000 for light and water extensions was authorized at a recent election. Address city clerk.

SHARON, N. DAK.—The village of Sharon has taken over the electric light plant. The recent election for bonding the village for $5000 for the purchase of the plant carried unanimously.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—Central Kentucky Light & Power Co. has been incorporated with a capital stock of $12,000 by W. R. Katterjohn, E. L. Uncapher and Edward Johnson. Mr. Johnson is resident manager of the company, which has opened offices on East Main street. Mr. Katterjohn is of Paducah, Ky., and Mr. Uncapher of Cincinnati. The debt limit is placed at $20,000.

LOUISVILLE, KY.—Rural Light & Power Company has incorporated with a capital of $6000. Incorporators: A. H. Thompson, R. M. Thompson, and W. R. Katterjohn.

MAYFIELD, KY.—The city has authorized a bond issue for $272,000 for the acquirement of the plant of the Mayfield Water & Light Company.

WALTON, KY.—Walton Electric Light Company, of which E. L. Kelly is manager, has asked prices on the following equipment: One 25-kilowatt, 250-volt, 220 r. p. m., direct current generator, for direct connection through flexible couplings. The company also plans to install a 10,000 gallon horizontal oil storage tank in which to store fuel oil for operating its plant.

WINCHESTER, KY.—Some electrical equipment will probably be required by the City of Winchester for a new municipal water plant, plans for which are being drawn by Engineer E. B. Kay. A delegation will shortly go to Washington to endeavor to arrange with the Government to obtain a permit for putting in water turbines at Lock No. 10, on the Kentucky River, to develop power to operate the pumps and machinery required in the plant.

FRIENDSHIP, TENN.—Marvel Milling Company, of which Messrs. Robertson and Cherry are proprietors, have purchased the wires and other equipment of the Friendship Electric Light & Power Company, also a new dynamo for the operation of the lights which will be installed in the new mill on Main street.

HAMPTON, TENN.—J. H. Edens is considering the immediate reconstruction of his electric lighting plant recently destroyed by fire.

LENIOR CITY, TENN.—A severe breakdown in the power plant of the Lenior City Electric Plant, resulted in the Lenior City Water Works being without power, and without coal to operate the private steam plant which has not been in operation since central-station service has been used. The matter was taken up with the State Fuel Administration, as the city was in danger of being without fire protection and coal was sent.

BIRMINGHAM, ALA.—Alabama Interurban Development Company has obtained permission to build 21 miles of electric roads. G. R. Marsh, general counsel for the company, has been authorized to prepare papers of incorporation with a capital of $5,000,000. Thomas L. Cannon, B. M. Allen, G. R. Marsh and others are directors.

CANTON, MISS.—The city has the installation of a surface condenser for a 200 horsepower engine and spray equipment for cooling in the municipal electric light plant under consideration.

PASCAGOULA, MISS. — Pascagoula Street Railway & Power Company contemplates the building of a two-mile extension of electric railway. Address R. A. Bowers, general manager.

OSCEOLA, ARK.—The city is planning to increase the capacity of its electric lighting plant by the installation of a 200-kilowatt generating unit.

BRISTOW, OKLA.—The city is planning to issue bonds for $36,000 for the acquirement of the local electric lighting plant.

CHANDLER, OKLA.—Washita Electric Power Company is planning for the construction of a brick and concrete power house, about 50x75 feet in size, and will make improvements and extensions in its distribution system.

OKLAHOMA CITY, OKLA.—A fire of unknown origin damaged the wholesale house of the Nunn Electric Company recently causing a loss estimated at about $50,000. The loss was fully covered by insurance.

AMARILLO, TEX.—City Commission is considering a bond issue for $200,000 for the construction of a new electric lighting plant.

DEL RIO, TEX.—Chas. A. Lindsey of Wichita, Kans., and associates are promoting the construction of a series of dams across Devil's River to provide water storage for irrigating large areas of land. It is also contemplated to install one or more hydroelectric plants in connection with the irrigation project.

DATES AHEAD.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, February 22-23, 1918. Secretary-Treasurer, L. B. Van Nuys, 238 South Jefferson Avenue, Peoria, Ill.

Vermont Electrical Association. Annual meeting February, 1918. Secretary-Treasurer, C. H. West, Rutland, Vt.

National Association of Electrical Inspectors. Annual convention, New York, March, 1918. Secretary-Treasurer, William L. Smith, Concord, Mass.

Wisconsin Electrical Association. Annual meeting, Pfister Hotel, Milwaukee, March 27-28, 1918. Secretary, George Allison, 1419 First National Bank Building, Milwaukee, Wis.

Tri-State Water & Light Association. Annual meeting. Charlotte, N. C., April, 1918. Secretary-Treasurer, W. F. Steiglitz, Columbia, S. C.

American Association of Engineers. Annual meeting, May 14, 1918. Secretary-Treasurer, A. H. Krom, 29 South La Salle Street, Chicago.

National Electrical Credit Association. Annual meeting, June 1, 1918. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill.

Texas State Association of Electrical Contractors. Annual meeting, Galveston, Tex., June 15, 1918. Secretary, H. S. Ashlay, Fort Worth, Tex.

Southeastern Section, National Electric Light Association. Annual meeting, June 19-20, 1918, Atlanta, Ga. Secretary-Treasurer, T. W. Peters, Columbus, Ga.

Northwest Electric Light & Power Association; affiliated with N. E. L. A. Annual meeting September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19, 1918. Secretary-Treasurer, W. W. Austin, Cottonwood Falls, Kans.

EAGLE PASS, TEX.—J. R. Sanford and associates will install two centrifugal pumps, each of 75 horsepower driven by electric motors for the purpose of pumping water for irrigating 2000 acres of land situated about seven miles south of Eagle Pass.

JEFFERSON, TEX.—Improvements in the electric lighting system are contemplated by the city.

SAN ANGELO, TEX.—San Angelo Water, Light & Power Company is constructing a concrete dam near Ben Ficklin on the South Concho River at a cost of approximately $12,500. The dam will provide a water supply sufficient to meet the demands of a city two or three times the size of San Angelo.

WESTERN STATES.

PHOENIX, ARIZ.—James B. Girard, former city engineer of Phoenix, and associates will construct a large hydroelectric plant in the Grand Canyon at the foot of Diamond Canyon in Mojave county. Preliminary work on this project has been in progress for some time. It is proposed that the electric energy which the plant will generate will be transmitted to mining districts and towns in a wide scope of country.

BOVILL, IDA.—Bonds amounting to $5500 have been voted for the installation of a municipal electric lighting plant.

PETERSBURG, ALASKA.—Council decided to investigate the feasibility of installing a turbine at or near the present waterworks dam with a view to furnishing power or a portion of the power for operation of the electric plant.

CLE ELUM, WASH.—Council has passed an ordinance granting South Cle Elum a franchise to construct, operate and maintain along, under and across certain streets in Cle Elum, wires, pipe or other forms of conduit for the purpose of conducting electricity, air, gas, water or other form of medium of communicating heat, light and power. Franchise is also granted for erecting wires for the transmission of telephone or telegraph service.

LA GRANDE, WASH.—Plans have been made by the American Nitrogen Products Company for the installation of three electric ovens to provide for increased capacity.

MORTON, WASH.—Robert Bailey has purchased the Morton Telephone Company. He will make repairs at once and will practically rebuild the system in the spring.

SEATTLE, WASH.—It has been decided to enlarge the scope of the bids received for extension of the city's power facilities. Council had previously passed an ordinance calling for bids for development of the lower Skagit river project. City Engineer Dimock reports that he investigated the offer of the Skykomish Power Company to sell the city a site on the South Fork of the Stillaguamish river; that it was feasible to develop from 30,000 to 40,000 horse power on this site and that if the Skagit river power site should not be acquired, the Stillaguamish project is worthy of a thorough investigation. An ordinance has been presented in the council to enable all owners of power sites, or all contractors, who desire to construct power plants, no matter where located to submit bids.

SEATTLE, WASH.—Superintendent of Lighting J. D. Ross, in a communication to the Board of Public Works has indicated his intention of making radical changes in the method of generating electric energy involving the construction of new improvements. In a letter to the Board of Public Works he states that in case the war continues, it appears to be only a matter of time when fuel oil will not be available for power purposes where other fuel may be substituted. He states that several alternatives present themselves, including the proposition to buy powdered coal; to buy screenings from local coal dealers and city pulverize; to buy screenings from British Columbia and city pulverize or to buy mill refuse. Estimate of cost of extra equipment for burning mill refuse are: Eight barges at $6000 each; receiving dock, $20,000; conveying machinery; storage bins, chutes, etc., in building, $10,000; remodeling eight furnaces, $25,000; incidentals, $12,000. The estimated cost of equipment for burning powdered coal is $200,000. He recommends the calling of bids to determine the price of these substitute fuels in large amounts for the year as follows: mill refuse, f. o. b. mill; mill refuse, f. o. b. scow at steam plant; screenings f. o. b. steam plant; screenings f. o. b. mine.

SEATTLE, WASH. — Puget Sound Traction, Light & Power Company has permit to erect a $75,000 coal burning plant at 1315 Western avenue.

SEATTLE, WASH.—Superintendent of Lighting J. D. Ross of Seattle, has made formal application in the name of the city for a preliminary report from the Department of Agriculture for the development of a power project at Rubey Creek Canyon on the Skagit River, together with all the storage not contemplated in a previous Diablo Canyon filing. He has also submitted to the State of Washington the letter of priority from Secretary D. F. Houston giving the city the right to occupy federal lands for a 25,000 kilowatt plant and also filed with the state an application for a permit to store and use the entire waters of Skagit river at a point at the mouth of Rubey Creek. The Skagit Power Company had a permit from the state for all water rights on the Skagit river and the application made by Ross anticipates a similar revocation to that made by the Department of Agriculture.

TACOMA, WASH.—Northwest Electric Company, 760 Commerce street, has completed the wiring of about 1800 buildings for the Government at Camp Lewis, near Tacoma, and is working on the Y. M. C. A. building there, also the Cassidy & McKee building and theatre building on the grounds of this camp.

HOOD RIVER, ORE.—Floods caused heavy damage to the plant of the Pacific Power & Light Company.

PROPOSALS

ELECTRIC OIL ENGINE, GENERATOR, ETC.—Bids for the installation of a 75-horsepower and a 35-horsepower internal combustion special electric oil engine, together with air compressor and tanks, piping, water cooling apparatus, a 50-kilovolt alternating current generator and a 30-kilovolt alternating current generator, will be received until 1 p. m., February 26, by A. E. Helund, chairman of the Village Board, of Dalton, Neb.

ENGINES AND DYNAMOS.—Bids for one 25-horsepower gasoline engine, one 16-horsepower oil gasoline engine, one 15-kilowatt direct current dynamo for the electric lighting plant will be received until noon, February 21, by J. S. Kallemeyer, village clerk of Firth, Neb.

TRAVELING CRANES.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until February 25 for furnishing traveling cranes for navy yard at a cost of $600,000.

CAPSTANS.—Bids will be received until 11 a. m., February 18, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing and installing ten electrically-driven capstans at the yards at Norfolk, Va., and Philadelphia, Pa.

EQUIPMENT FOR POWER PLANT.—Bids for the installation of mechanical equipment in power plant at Philadelphia, Pa., will be received until February 18 by the Bureau of Yards and Docks, Navy Department, Washington, D. C. The new equipment will involve the expenditure of $110,000.

POWER PLANT EQUIPMENT.—Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until February 18, for the installation of mechanical equipment in the power plant at Norfolk, Va., at an estimated cost of $110,000.

SUBMARINE CABLE.—Bids will be received by the city of Chicago on February 18 at Room 406 City Hall for furnishing and delivering at the city dock, located at 653 West Chicago avenue, 10,550 feet of submarine cable in accordance with specifications on file in the office of the Department of Public Works. Address Frank I. Bennett, Commissioner of Public Works.

DIRECT CURRENT GENERATOR.—Bids for the installation of one 25 horsepower and 15-horsepower oil kerosene engine and one 15-kilowatt direct current generator in the electric light plant will be received until noon, February 21 at Firth, Neb. Address J. S. Kallemeyer, village clerk.

HYDROELECTRIC PLANT.—Bids will be received at Seattle, Wash., until March 1 for the construction of a hydroelectric plant to cost $5,000,000.

INCORPORATIONS

NEW CASTLE, PA.—Connoquenessing Lawrence Light & Power Company has incorporated with a capital stock of $10,000. Incorporator, E. G. Dunlap.

NORRISTOWN, PA. — Montgomery Transit & Light Company has filed articles of incorporation under the laws of the State of Delaware to build and operate electric railways and lighting plants. The company's capitalization is $1,000,000 and it is understood that it will take over the Montgomery Transit Company, which operates a railway from Norristown to Harleysville.

HAMILTON, ONT., CANADA.—Boston Insulated Wire & Cable Company. Capital, $200,000. The company will manufacture cables, wire, etc. Incorporators: Benjamin T. Burley, of Worcester, Mass.; Harry B. Burley, of Brookline, Mass.; Grant W. Arnold, of Hamilton, and others.

NEW YORK, N. Y.—Uneedus Mercantile Corporation has been incorporated with a capital of $30,000, to manufacture telephone and acoustic apparatus. The incorporators are I. E. A. Konigsberg, H. J. Lucke and S. M. Bender, 2 Rector street, New York City.

INDIANAPOLIS, IND.—Guide & Signal Light Company has incorporated with a capital of $100,000 and will manufacture electrical devices. Richard McClellan, L. Greenburg and Robert Eaglesfield are the incorporators.

HOUSTON, TEX. — Hannah Conveyor Company has incorporated with a capital of $5,000 and will manufacture conveyors and trolley systems. The incorporators are Edward Hanak, J. G. Belton and Robert Kornbeck.

WORCESTER, MASS.—Stenman Electric Valve Grinding Company has incorporated with a capital of $50,000. B. F. Stenman is president of the company, and Albert W. Larson, treasurer.

DAYTON, OHIO.—Cuthbert Company has organized with a capital of $500,000. The organizers are Charles S. Hall, of the Hall Electric Company, Dayton, and others. The company will manufacture electrical devices.

MILWAUKEE, WIS.—Electric Welding & Manufacturing Company. Capital, $10,000. Incorporators: Oscar Greulich, George F. Leuhring and Joseph Stika.

STANLEY, WIS.—Junction Telephone Company. Capital, $11,000. Incorporators: F. J. Brzostowicz, Lawrence Panicki, Joseph Markowski, Stanislaus Cutowski and O. H. Larson.

CHICAGO, ILL.—Battery Service Company. Capital, $12,000. Incorporators: Ward Sperry, F. J. Freitag and Frederick S. Armstrong.

AKRON, OHIO.—Akron Electric Regulator Company. Capital, $100,000. Incorporators: William Stephens, H. K. Raymond, William F. Pfeiffer, C. W. McLaughlin, W. Franklin Clark and John W. Thomas.

CONGO, OHIO.—Racoon Telephone Company. Capital, $300. Incorporators: J. J. Taylor, George Wyatt and D. S. Reams.

BUFFALO, N. Y.—Evanwood Battery Corporation has filed incorporation papers and will manufacture chemical electric batteries. The concern, which is capitalized at $500,000, has as its directors Richard H. Templeton, H. J. Wood and H. E. Evans.

DOVER, DEL.—R. G. Mullens Manufacturing Company has incorporated with a capital of $10,000 to manufacture engines, motors, etc. Incorporators: R. G. Mullens, John Massman and S. Janvier, New York.

Financial News

Banking Power of the United States.

The power of the United States as a banking institution is strikingly presented in the annual report of Comptroller Williams in his annual report to Congress. In the estimates given by Mr. Williams the banking power of the United States is placed at the remarkable total of $37,529,000,000, which represents an increase of over $14,300,000 since the beginning of the present administration. The country's banking power has increased seven-fold since 1890—a period of a little over a quarter of a century—and it is nearly two and one-half times as great as the banking power of the world, as estimated by Mulhall, in the year mentioned, namely, $15,558,000,000. The resources of the national banks as given by the comptroller, viz., $18,553,197,000, are greater by over $2,000,000,000 than ever before. They exceed the combined resources of all state banks doing a commercial business and of private banks and companies by about the same amount, and they have increased over $7,000,000,000 under three years of the Federal Reserve system. The comptroller notes, as indicative of the financial position of the country, that in the past three calendar years the aggregate balance of trade in our favor has exceeded eight billions of dollars; that we have imported about a billion dollars in gold; that we have practically paid off the five billions which we owed at the outbreak of the war in the shape of American securities, and that we have loaned over two billions in various foreign countries, exclusive of the large advances made by the government to the Allies.

First Mortgage Bonds Offered.

The West Virginia Water & Electric Company, Charleston, W. Va., is offering $1,250,000 first mortgage five year 6 per cent gold bonds. The bonds are dated September 1, 1917, and are due September 1, 1922, with interest payable March 1 and September 1 at the Central Trust Company of Illinois, Chicago. The company is a West Virginia corporation, which owns and operates, free from competition, the water, electric light and power systems located in Charleston, W. Va., and the immediate adjacent suburban districts, serving a population of 33,000. The company has an authorized capitalization of $4,000,000, consisting of $1,000,000 7 per cent cumulative preferred stock and $3,000,000 of common stock. The refinancing of the company at this time is necessitated by demands of the United States Government for service at the large armor and projectile plant now in process of construction at Charleston. The certainty of increased population and the stability of a manufacturing community combined with the cheap supply of fuel, put the West Virginia Water & Electric Company in an unusually favorable position.

Benjamin Electric Stock Issue.

A group of Chicago banking firms is offering an issue of $750,000 Benjamin Electric Manufacturing company 8 per cent cumulative first preferred stock at 99½. The Chicago company is said to be the largest manufacturer of industrial illuminating devices in the country. It recently absorbed the Royal Enameling & Manufacturing company, with a factory at Desplaines, Ill. Besides the $750,000 first preferred, there are outstanding $910,000 7 per cent cumulative second preferred and $660,000 common stocks. The company has no bonded debt. The entire proceeds of the first preferred issue will be used to retire notes and increase working capital. Combined net earnings of the two companies for the year ended Dec. 31, 1917, were $397,846, against which there is an estimated federal tax of about $100,000, leaving $297,000 available for dividends. The earnings have increased steadily since 1914, when the combined net profits were $113,794.

Annual Report of Kings County Electric Light & Power Company.

The annual report of the Kings County Electric Light & Power Company, Brooklyn, N. Y., has been issued for the year ending December 31, 1917, and shows that the company has held its own though feeling keenly the effects of a reduced rate schedule and the existing high prices for labor, materials and supplies.

A condensed statement of earnings and expenses, with 1916 comparisons, follows:

	1917.	1916.
Total revenues	$8,381,055.25	$8,204,808.66
Expenses including taxes and reserve for property retired	5,511,982.25	5,014,050.03
Gross income	$2,869,073.00	$3,190,758.63
Contingencies reserve	596,704.14	569,174.65
	$2,272,368.86	$2,621,583.98
Int. and discount.	$ 802,710.78	$ 761,628.62
Dividends, etc.	1,425,522.10	1,293,509.86
Surplus for year.	$ 44,135.98	$ 566,445.50
Adjustments, previous years.	59,463.68	*69.83
Credit to profit and loss	$ 103,599.66	$ 566,375.67
Stock outstanding Dec. 31.	$17,156,500.00	$15,651,200.00

*Deduction.

The above results have been accomplished through the practice of strict economy, together with energetic efforts to increase the number of consumers. Over 800 residences and 900 retail stores have been wired and added to the lines under the Company's Partial Payment Wiring Plan, and power contracts aggregating upwards of 58,000 horsepower have been signed. During the year 43,178 contracts were signed.

To supply the demand for power occasioned by the large increase in the number of customers, extensive additions were made in the transmission and distribution systems. Eighty-six miles of feeders and mains were installed, forty-six miles being placed underground. Additional generating capacity was supplied by completing the installation and putting into operation a 30,000-kilowatt (40,000 horsepower) turbogenerator with auxiliary apparatus at the Gold Street Station. An additional 12,500-kilowatt turbogenerator will be installed during the present year, bringing the maximum capacity of this station up to 100,000 kilowatts. Plans for additions at the 66th street generating station were completed and are now being carried out.

On January 9, 1917, the last half of the authorized issue of $5,000,000 6 per cent, twelve-year, convertible debenture bonds, dated March 1, 1913, were offered to stockholders, all of which were subscribed. At the close of 1917 there had been converted into stock $3,642,600 of the 1910 series of $4,000,000 6 per cent, twelve-year, convertible debenture bonds, and $3,513,900 of the 1913 series of $5,000,000 of similar bonds. The stockholders of the company now number over 1,700.

Two vacancies occurred in the board of directors through the deaths of William Berri and William F. Sheehan, both of whom had served the company for nearly twenty years. These vacancies were filled by the election of Charles A. Boody and Herbert L. Bridgman.

The company has co-operated wherever possible toward furthering the welfare of the Nation in the present crisis. Upwards of two hundred of its employes are now enrolled in the various branches of the country's service; both company and employes subscribed liberally for Liberty Bonds; war savings and thrift stamps are on sale at nine of the company's offices, which come in contact with the general public; and advertising and billboard space has been placed at the disposal of the Food and Fuel Administrations.

The company, which has been loyally supported by an energetic corps of employes, has made every effort to render thoroughly efficient service to its patrons and to co-operate with municipal and federal authorities in carrying out special requirements necessitated by the war.

Through a continuance of last year's practice, and in anticipating as far as possible, and meeting unusual conditions as they may arise, the company expects to achieve the best obtainable results during 1918.

Illinois Traction's Financial Problems.

Illinois Traction System, Peoria, Ill., is running in the various daily papers of towns and cities served by its component utility properties some interesting publicity matter upon the general financial conditions under which these companies must operate and must render their service to the public. The advertising matter is entitled "Our Problems Are the People's Problems" and illustrates how the same increased costs of production and operation which strike all lines of business and individual expenses as well weigh heavily upon these utility properties inasmuch as they cannot increase their revenue without sanction from the Illinois Public Utilities Commission. The articles are well written and are exceedingly timely in view of the fact that the Illinois Traction System and certain other large public utility companies of Illinois consider it imperative to ask a general increase in the price of their output.

Standard Electric Preferred Stock Offered.

Standard Electric & Elevator Company, Inc., Baltimore, Md., is making a special offer for a limited period, and subject to prior sale, $100,000 or more of 7 per cent accumulative preferred stock, registered by the Union Trust Company of Baltimore. A bonus consisting of one-quarter share of non-assessable common stock will be given with each share. Complete information regarding this special stock issue of the company together with other valuable data is contained in the prospectus, which will be furnished upon request.

Indiana Power Notes Sold.

An issue of Indiana Power & Water Company two and one-half-year 7 per cent collateral trust notes, offered recently by a syndicate of Chicago bankers, of which King, Hoagland & Company were managers, has been sold.

Dividends.

Central Arkansas Railway & Light Corporation has declared its regular quarterly dividend of 1¾ per cent on preferred stock, payable March 1 to stock of record February 15.

As an aid in making up income tax schedules, the Commonwealth Edison company has notified its stockholders that of the dividend of $2 a share paid February 1, 1917, $1,169 was paid out of the surplus earnings of January, 1917, and 83 represented earnings in December, 1916. All other dividends paid in 1917 were paid out of the earnings of that year.

On the preferred stock Western Pacific Railroad Corporation has declared a dividend of 6 per cent, payable in installments of 1½ per cent each on February 20, 1918, to holders of record February 15; April 1 to holders of record March 20; July 1 to holders of record June 20 and October 1 to holders of record September 20. The dividend was declared out of a net profit for the fiscal year ended December 31, 1917.

Tampa Electric Company has declared a quarterly dividend of $2.50 a share, payable February 15 to stock of record February 4.

Offer West Virginia Utility Bonds.

Tison & Company and Powell, Garard & Company and a syndicate of bankers are offering $1,250,000 West Virginia Water & Electric Company first mortgage five-year bonds, at a price to yield 7 per cent to the investors.

CHICAGO & ALTON.

Report to Interstate Commerce Commission:

	1917	1916
November gross	$ 1,716,180	$ 1,585,714
Net after tax	197,242	359,516
Net operating income	93,650	268,061
Eleven months' gross	18,887,282	16,228,708
Net after tax	4,625,726	4,348,542
Net operating income	3,420,015	3,537,007

EARNINGS.

GREAT NORTHERN.

For December—	1917.	Decrease.
Total operating revenue	$ 6,884,842	$ 115,448
Net operating revenue	1,946,939	1,161,589
Operating income	1,165,157	1,401,112
For year ended Dec. 31—		
Total operating revenue	$88,534,163	*$5,382,146
Net operating revenue	29,290,377	5,346,348
Operating income	22,987,545	6,179,226

*Increase.

WESTERN PACIFIC.

For December and the year 1917—

	Dec.	Year ended Dec. 31.
Gross operating revenue	$878,837	$9,898,483
Operating income	278,002	3,215,935
Net income	22,410	85,779
Surplus	309,412	3,301,715

INTERNATIONAL GREAT NORTHERN.

For December—	1917.	Increase.
Gross operating revenue	$ 1,260,865	$ 206,853
Operating income	403,454	155,573
For year ended Dec. 31—		
Gross operating revenue	$12,588,224	$1,821,279
Operating income	3,577,367	1,017,927

COLORADO POWER COMPANY.

Power contracts of the Colorado Power Company for the year 1917 aggregated 10,497 horsepower at an estimated revenue of $350,912. Net gain in new business for the year was 7,024 horsepower or $242,235. On December 31 new business under contract but not yet constructed totaled 4,130 horsepower at an estimated annual revenue of $152,400. It is expected that this business will be in operation and productive of revenue by the end of September, 1918.

WEST PENN POWER COMPANY.

Gross earnings, including miscellaneous income, for twelve months ending November 30, totaled $3,899,859; net earnings, $1,332,500. Annual interest on the entire funded debt now outstanding in the hands of the public, including the 2-year 7 per cent collateral gold notes, requires $650,000.

PACIFIC GAS AND ELECTRIC COMPANY.

For the twelve months to December 31: Gross, $19,813,381, increase $1,197,883; net, after taxes, etc., $6,958,690, decrease $847,925; total income, $7,467,037, decrease $849,464; surplus, after charges, $3,181,030, decrease $117,302; balance, after preferred dividends, $1,696,738, decrease $1,211,387.

SOUTH CAROLINA LIGHT, POWER & RAILWAY.

South Carolina Light, Power & Railway Company's report for December shows gross earnings of $67,915, the largest of any one month in the company's history. This represents an increase of 36 per cent over December, 1916. Net earnings for the month were $38,800, an increase of 52 per cent; surplus after all charges is $16,400, an increase of 121 per cent. Increases are ascribed largely to economy of water power on which the company benefit.

BLACKSTONE VALLEY GAS & ELECTRIC COMPANY.

	1917.	1916.
December gross	$ 188,557	$ 160,779
Net	48,324	59,658
Surplus after charges.	22,200	34,560
Twelve months' gross.	1,991,844	1,744,928
Net	641,669	762,578
Surplus after charges.	337,503	460,719

AMERICAN LIGHT & TRACTION COMPANY.

Income statement of the American Light & Traction Company for twelve months ended December 31, 1917, compared as follows:

	1917.	1916.	1915.	1914.
Gross earnings	$ 5,392,615	$ 5,859,938	$ 5,178,387	$ 4,432,380
Expenses	369,234	211,911	156,623	157,293
Net earnings	*$ 5,023,381	$ 5,648,027	$ 5,021,764	$ 4,275,087
Preferred dividends	854,172	854,172	854,172	854,172
Common dividends	1,986,967	1,801,797	1,632,645	1,478,880
Surplus	$ 2,182,242	$ 2,992,058	$ 2,534,947	$ 1,942,035
Previous surplus	12,051,599	10,861,339	9,959,037	9,495,882
Total surplus	$14,233,841	$13,853,397	$12,493,984	$11,437,917
Common stock dividends	1,986,967	1,801,797	1,632,645	1,478,880
P. & L. surplus	$12,246,874	$12,051,600	$10,861,339	$ 9,959,037

*After dividends on the preferred stock, the balance available for the $20,588,900 common stock was equal to $20.25 a share, against $25.66 a share for $18,681,200 common stock in 1916.

The condensed balance sheet of the American Light & Traction Company, as of December 31, 1917, compares as follows:

ASSETS.

	1917.	1913.	1915.	1914.
Investment account	$34,384,752	$33,946,415	$32,671,440	$24,860,356
Temporary investment	5,838,856	1,522,649	1,946,984	1,946,616
Sub co. earnings	5,637,880	6,328,790	6,487,704	9,621,000
Bills receivable	1,723,933	2,470,007	1,113,040	3,093,358
Accounts receivable	180,510	125,696	83,396	68,966
Stock contracts	16,100	19,250	28,000	59,050
Interest and dividends received	57,135	16,180	22,060	13,891
Miscellaneous	.....	7,519	.....	.....
Cash	1,564,395	2,705,265	1,660,524	1,791,093
Total	$49,403,560	$47,142,671	$44,013,148	$41,454,330

LIABILITIES.

Preferred stock	$14,236,200	$14,236,200	$14,236,200	$14,236,200
Common stock	20,588,900	18,681,200	16,928,900	15,329,000
Warrants	84,372	52,797	47,108	54,360
Bills payable	90,000	.....	.....	.....
Contract department	6,368	4,924	4,212	13,704
Miscellaneous	7,709	28,572	.....	535
Taxes, etc.	116,539	57,159	49,060	41,665
Accounts payable	12,184	66,403	63,126	43,426
Dividends accrued	1,171,807	1,076,422	988,807	908,812
Reserve	842,607	887,396	834,397	867,591
Surplus	12,246,873	12,051,598	10,861,339	9,959,038
Total	$49,403,560	$47,142,671	$44,013,148	$41,454,330

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid. Feb. 5.	Bid. Feb. 12.
Adirondack Electric Power of Glens Falls, common	6	15	14½
Adirondack Electric Power of Glens Falls, preferred	6	70	71½
American Gas & Electric of New York, common	10 +extra	87	88
American Gas & Electric of New York, preferred	6	39½	40½
American Light & Traction of New York, common	..	210	215
American Light & Traction of New York, preferred	6	92	94
American Power & Light of New York, common	4	45	43
American Power & Light of New York, preferred	6	69	72½
American Public Utilities of Grand Rapids, common	..	20	20
American Public Utilities of Grand Rapids, preferred	6	54	54
American Telephone & Telegraph of New York	..	108	106½
American Water Works & Elec. of New York, common	..	3¾	4¾
American Water Works & Elec. of New York, particip	7	9	9
American Water Works & Elec. of New York, first preferred	..	60	60
Appalachian Power of Bluefield, common	..	2¼	2¼
Appalachian Power of Bluefield, preferred	7	20	20
Cities Service of New York, common	+extra	211	209
Cities Service of New York, preferred	6	74	74
Commonwealth Edison of Chicago	8	108	107
Comm. Power, Railway & Light of Jackson, common	..	20	20
Comm. Power, Railway & Light of Jackson, preferred	6	48	50
Federal Light & Traction of New York, common	..	5	..
Federal Light & Traction of New York, preferred	..	28	..
Illinois Northern Utilities of Dixon	6	76	..
Middle West Utilities of Chicago, common	2+extra	25	25
Middle West Utilities of Chicago, preferred	6	60	60
Northern States Power of Chicago, common	ex.div.7	60	61
Northern States Power of Chicago, preferred	ex.div.7	87	87
Pacific Gas & Electric of San Francisco, common	..	33½	33½
Pacific Gas & Electric of San Francisco, preferred	6	81	81
Public Service of Northern Illinois, Chicago, common	7	74½	72
Public Service of Northern Illinois, Chicago, preferred	6	86	88
Republic Railway & Light of Youngstown, common	4	23	23¼
Republic Railway & Light of Youngstown, preferred	6	56	56
Standard Gas & Electric of Chicago, common	..	5½	6
Standard Gas & Electric of Chicago, preferred	6	22	23
Tennessee Railway, Light & Power of Chattanooga, common	..	2½	2½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	10	10
United Light & Railways of Grand Rapids, common	4	27	27
United Light & Railways of Grand Rapids, preferred	6	61	61½
Western Power of San Francisco, common	..	11	11
Western Power of San Francisco, preferred	6	45	46
Western Union Telegraph of New York	extra	91	90½
Industrials—			
Electric Storage of Philadelphia, common	4	48	49
General Electric of Schenectady	8	137½	137½
National Carbon of Cleveland, common	8	56¼	56¼
National Carbon of Cleveland, preferred	..	130¾	130¾
Westinghouse Electric & Mfg. of Pittsburgh, common	+extra	41¼	41¼
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	60	60

*Last sale.